US007520240B2

(12) **United States Patent**
Tufte

(10) **Patent No.: US 7,520,240 B2**
(45) **Date of Patent: Apr. 21, 2009**

(54) **COVER SYSTEM FOR A BOAT**

(76) Inventor: **Brian N. Tufte**, 17488 Wexford Dr., Eden Prairie, MN (US) 55347

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 85 days.

(21) Appl. No.: **10/905,818**

(22) Filed: **Jan. 21, 2005**

(65) **Prior Publication Data**

US 2006/0162640 A1 Jul. 27, 2006

(51) **Int. Cl.**
B63B 17/00 (2006.01)

(52) **U.S. Cl.** **114/361**

(58) **Field of Classification Search** 114/361; 296/99.1, 100.11, 100.12, 100.14, 107.13, 296/107.14, 107.18, 136.1, 136.12
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

245,651	A		8/1881	Meech	
600,272	A	*	3/1898	Seymour	114/361
869,399	A	*	10/1907	Walter	114/361
2,493,833	A		1/1950	Reynolds	
2,570,911	A		10/1951	Birdlebough	
2,947,277	A		8/1960	Stevens	
3,083,540	A		4/1963	Smith	
3,160,436	A	*	12/1964	Duddleston	296/105
3,179,959	A		4/1965	McDougall	
3,195,549	A		7/1965	Stevens	
3,312,990	A	*	4/1967	Lapworth	114/361
3,370,308	A		2/1968	Krenzler	
3,434,166	A		3/1969	Clymer	
3,572,353	A		3/1971	Pinkley	
3,805,724	A	*	4/1974	Butler	114/71
3,942,830	A	*	3/1976	Woodard	296/105
3,955,228	A		5/1976	Gaschenko et al.	
4,019,212	A		4/1977	Downer	
4,223,414	A		9/1980	Dickson	
4,641,600	A		2/1987	Halvorsen	
4,926,782	A		5/1990	Lacy	
4,979,456	A		12/1990	Steward	
5,009,184	A		4/1991	Voldrich	
5,016,558	A	*	5/1991	Oehler	114/361

(Continued)

FOREIGN PATENT DOCUMENTS

DE	29508245	8/1995	

(Continued)

OTHER PUBLICATIONS

Floe, "Aluminum PWC, Boat & Pontoon Lift Systems," Floe International, Inc., 12 pages, 2005.

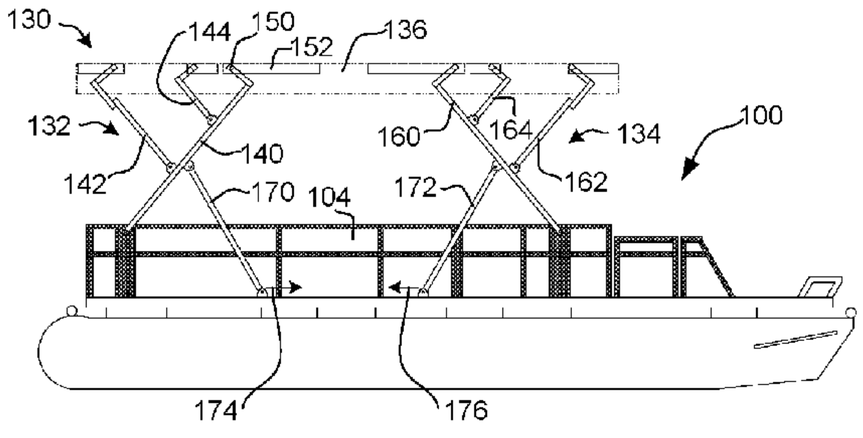
(Continued)

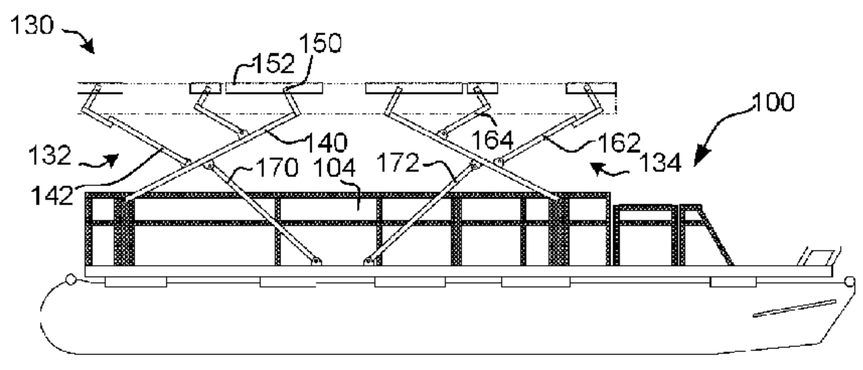
Primary Examiner—Lars A Olson
(74) *Attorney, Agent, or Firm*—Brian N. Tufte

(57) **ABSTRACT**

A boat cover system that can provide some level of protection to the interior of the boat when the boat is not in use, and can also provide some level of protection to the occupants of the boat when the boat is in use. The cover system may include a cover assembly that includes a support frame and a cover, where the support frame supports the cover. One or more cover supports may be provided for supporting the cover assembly. The one or more cover supports may be adapted to allow the cover assembly to be moved between a raised position and a lowered position.

29 Claims, 17 Drawing Sheets





U.S. PATENT DOCUMENTS

5,044,298	A *	9/1991	Pepper et al.	114/361
5,058,946	A *	10/1991	Faber	296/186.4
5,303,667	A	4/1994	Zirkelback et al.	
5,458,079	A	10/1995	Matthews et al.	
5,479,872	A	1/1996	Hulett	
5,706,752	A	1/1998	Menne, Jr. et al.	
5,769,105	A	6/1998	Margol et al.	
5,803,104	A	9/1998	Pollen	
5,850,799	A	12/1998	Geisel et al.	
5,894,812	A	4/1999	Dessingue	
5,901,657	A	5/1999	Schwartz	
5,909,921	A *	6/1999	Nesbeth	296/100.1
5,983,824	A	11/1999	Hernandez	
6,102,059	A	8/2000	Miller	
6,158,377	A	12/2000	Szukhent, Jr.	
6,209,477	B1	4/2001	Biedenweg	
6,260,505	B1	7/2001	Polidan	
6,439,150	B1	8/2002	Murphy et al.	
6,443,090	B1	9/2002	Giffin et al.	
6,447,038	B1	9/2002	Davis et al.	
6,659,035	B2	12/2003	Treytiak	
6,666,163	B2	12/2003	Pastor et al.	
6,688,252	B1	2/2004	Caravella	
6,786,171	B1	9/2004	Elbers	
6,820,569	B2	11/2004	Warfel et al.	
6,983,716	B1	1/2006	Ankney et al.	
7,051,669	B2	5/2006	Warfel et al.	
7,216,604	B2	5/2007	Finney et al.	
7,370,597	B1	5/2008	Schwindaman	
7,412,940	B2	8/2008	Kemmer et al.	
2003/0127037	A1	7/2003	Himmel	
2003/0217683	A1 *	11/2003	Heckman	114/361
2004/0070516	A1	4/2004	Nielsen	
2006/0231010	A1	10/2006	Baylor	
2008/0011217	A1	1/2008	Russikoff	

FOREIGN PATENT DOCUMENTS

GB	2275450	8/1994
GB	2392881	3/2004

OTHER PUBLICATIONS

Sea-Legs, "The Pontoon Lift That Goes Where You Go," 4 pages, 2005.

http://www.custompontoonboatkitsetc.com, "Custom Pontoon Boat Kits etc.", 7 pages, printed Feb. 1, 2005.

http://www.hilltopboat.com, "Boat Covers—Pontoon—0279-1551 Pontoon w Fold Down Hard Top 14'6"×a02"-0279", 2 pages, printed Feb. 1, 2005.

http://www.taylormarine.com/press_releases/pressarchive.php, Capabilities—Archived Press Releases, Taylor Made Systems, Taylor Made Systems unveils Power Convertible Top, 2 pages, printed Mar. 3, 2006.

http://www.taylormarine.com/press_releases/pressarchive.php, Capabilities—Archived Press Releases, Taylor Made Systems, Taylor Made Power Power Convertible Top Featured At IBEX, 2 pages, printed Mar. 3, 3006.

* cited by examiner

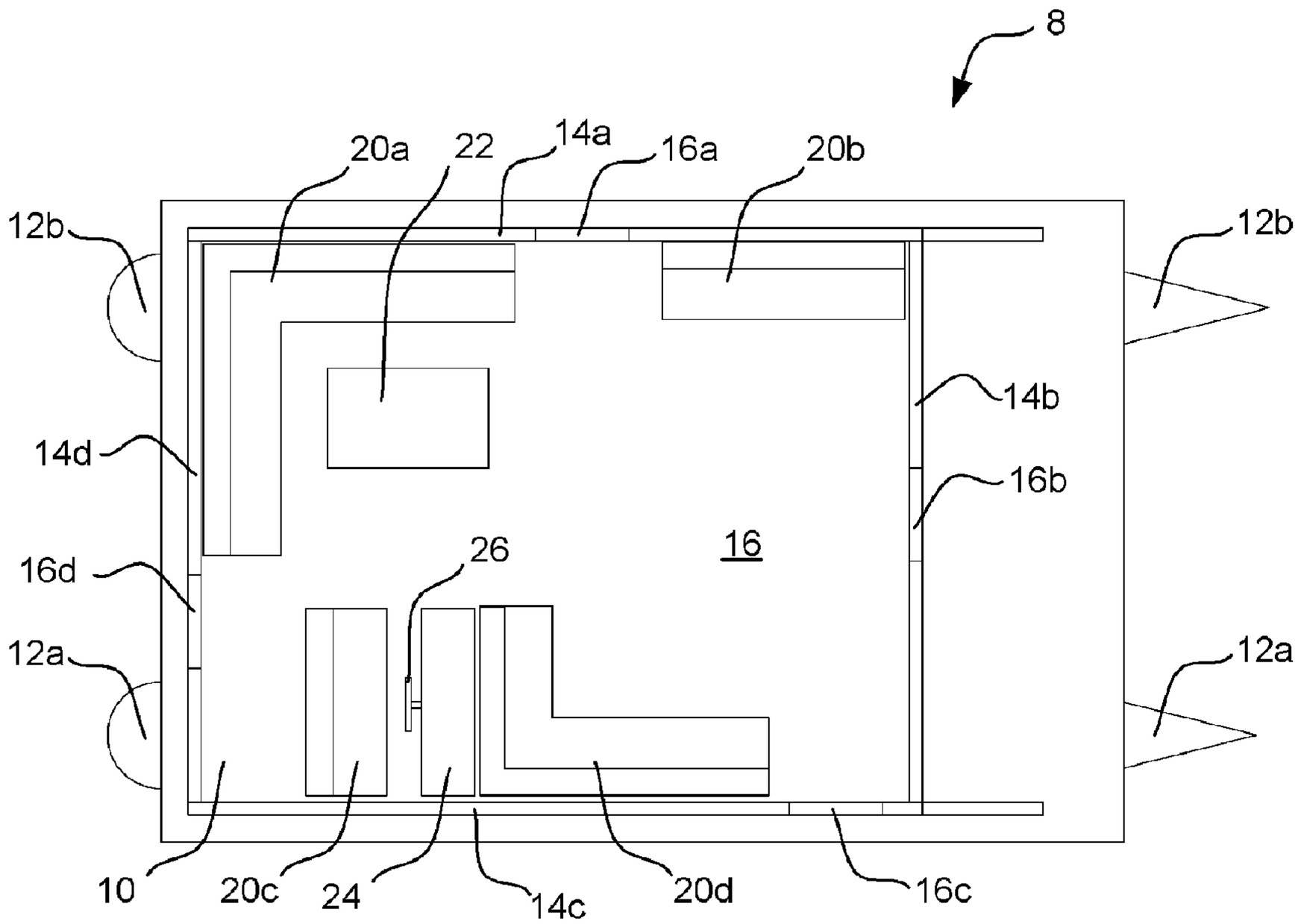

8
20a
22
14a
16a
20b
12b
12b
14b
14d
16b
16
26
16d
12a
12a
10
20c
24
14c
20d
16c

Figure 1

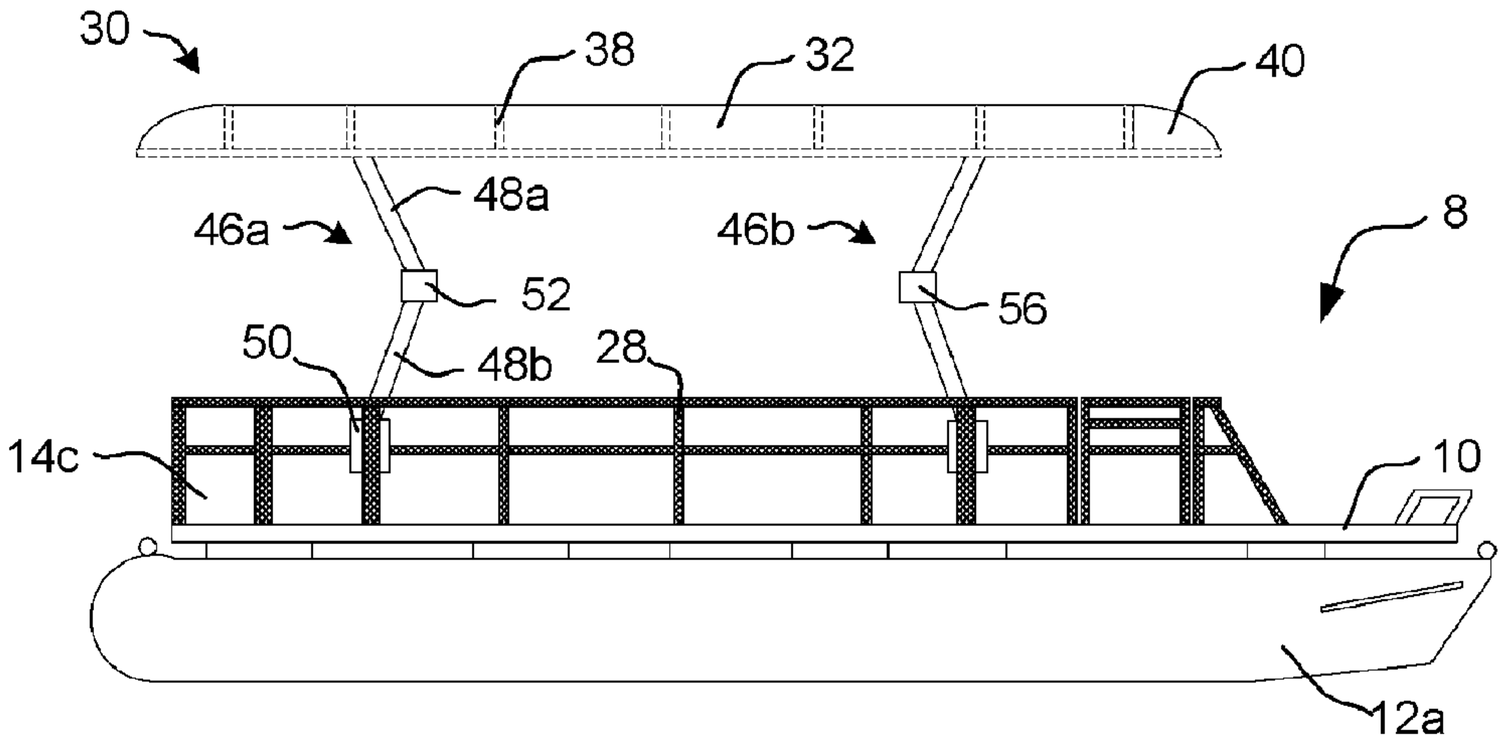


Figure 2A

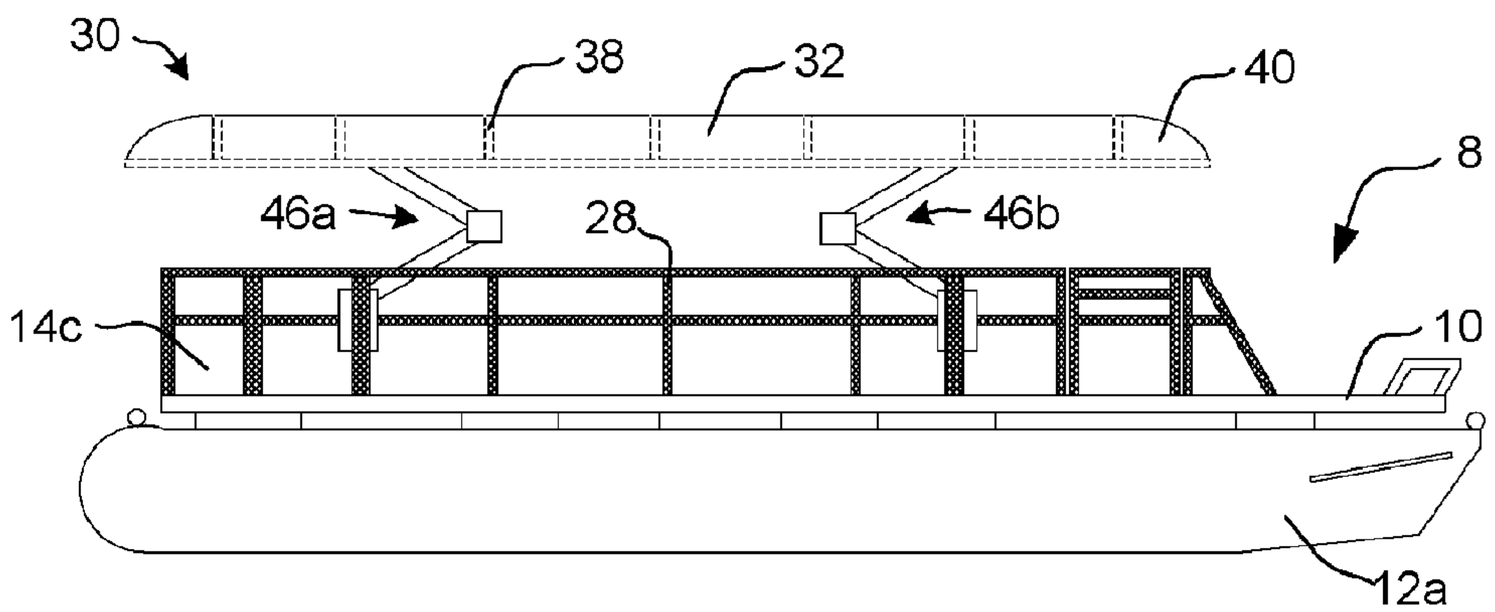


Figure 2B

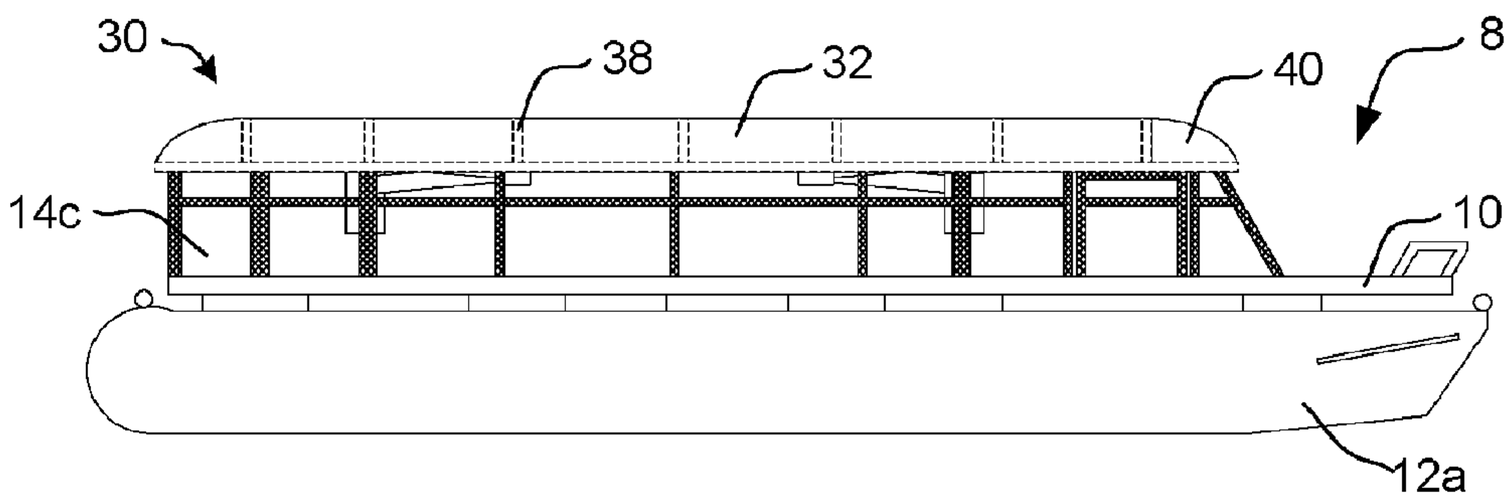


Figure 2C

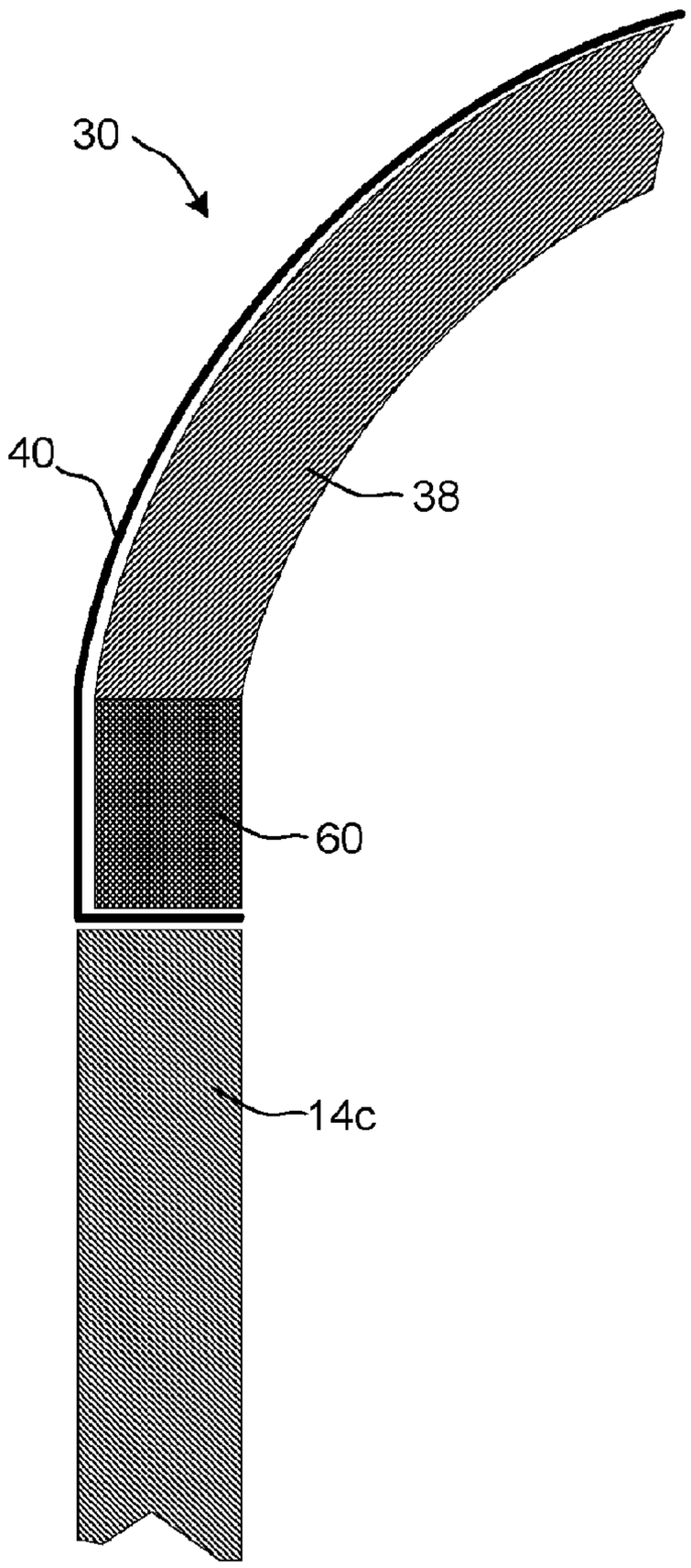


Figure 3

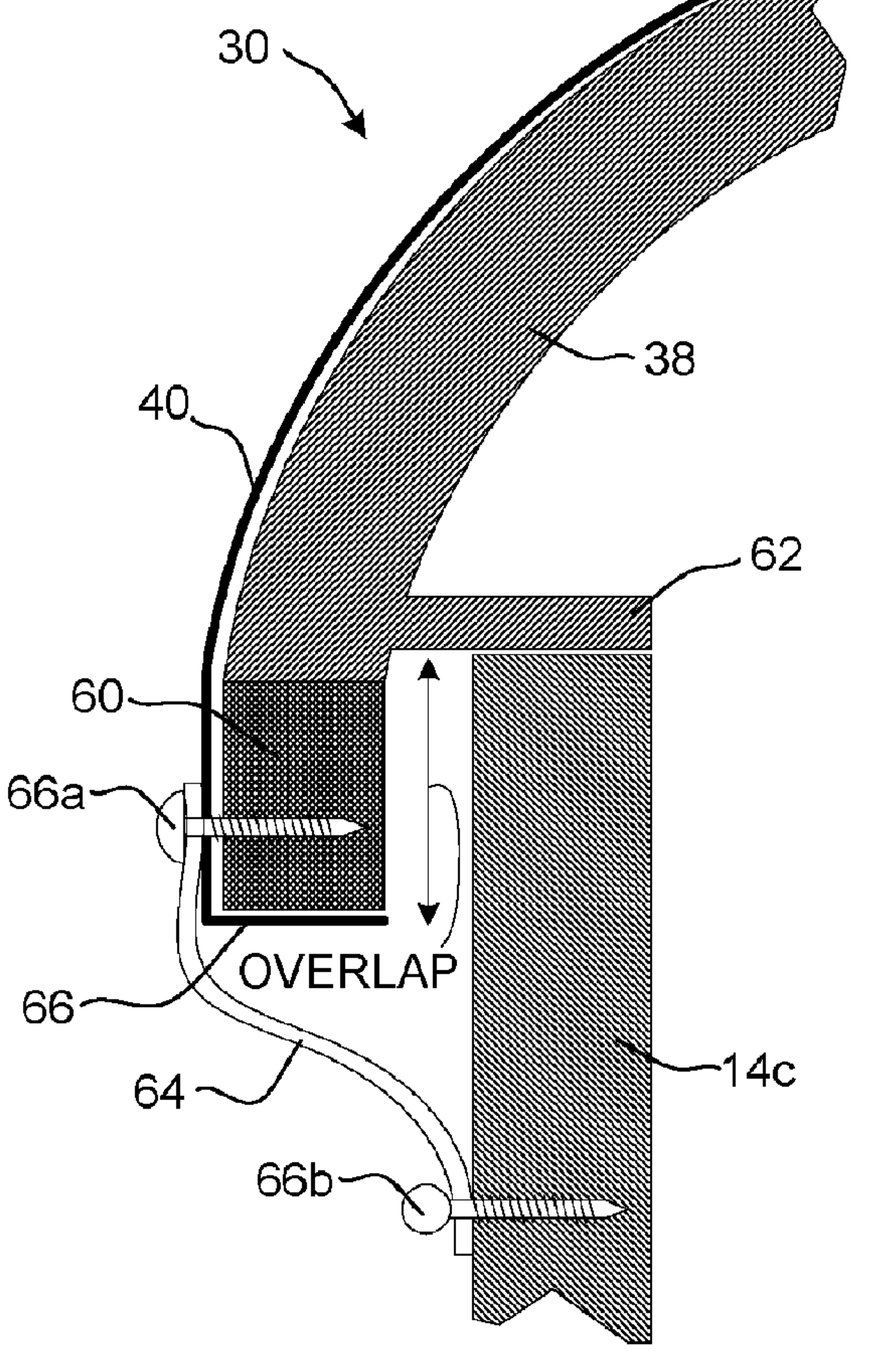


Figure 4

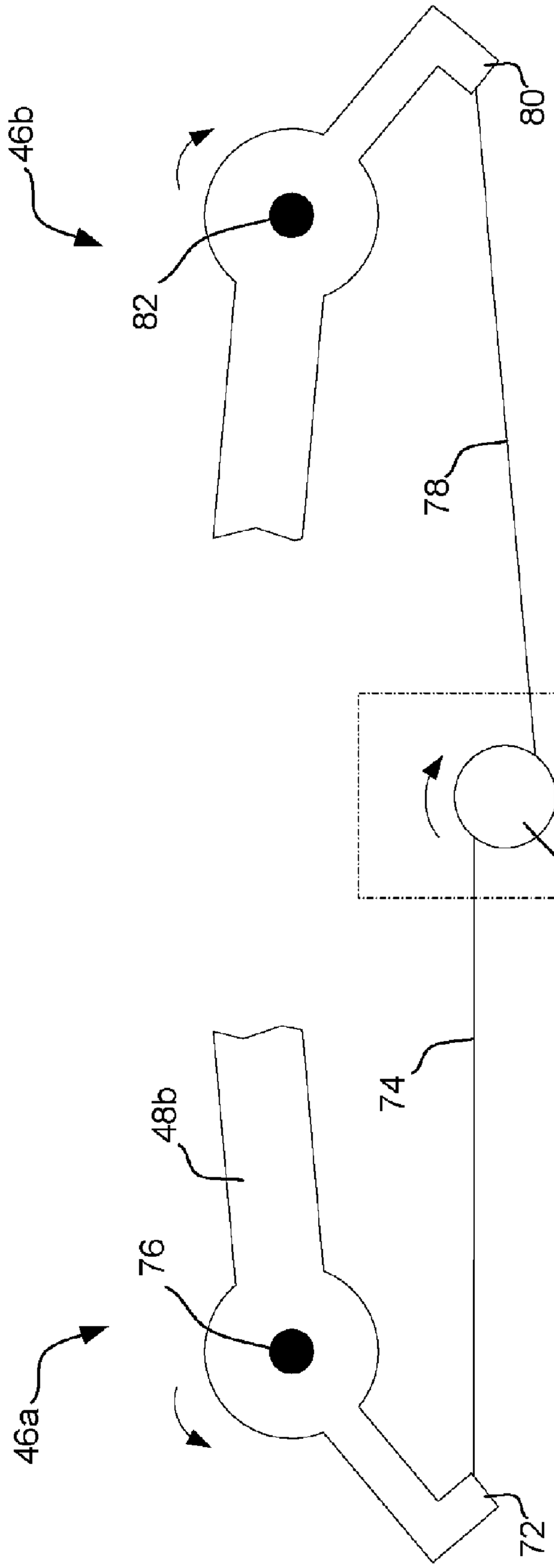


Figure 5A

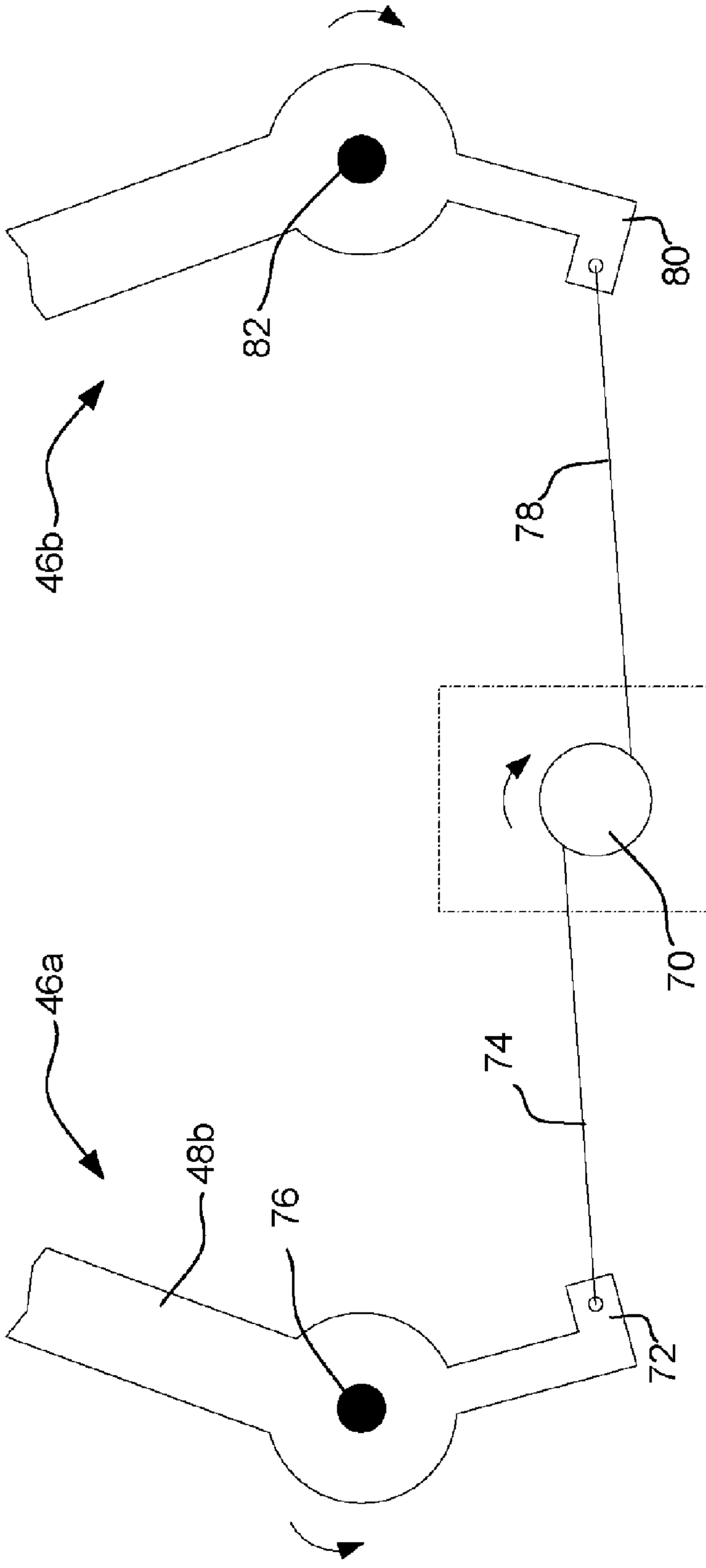


Figure 5B

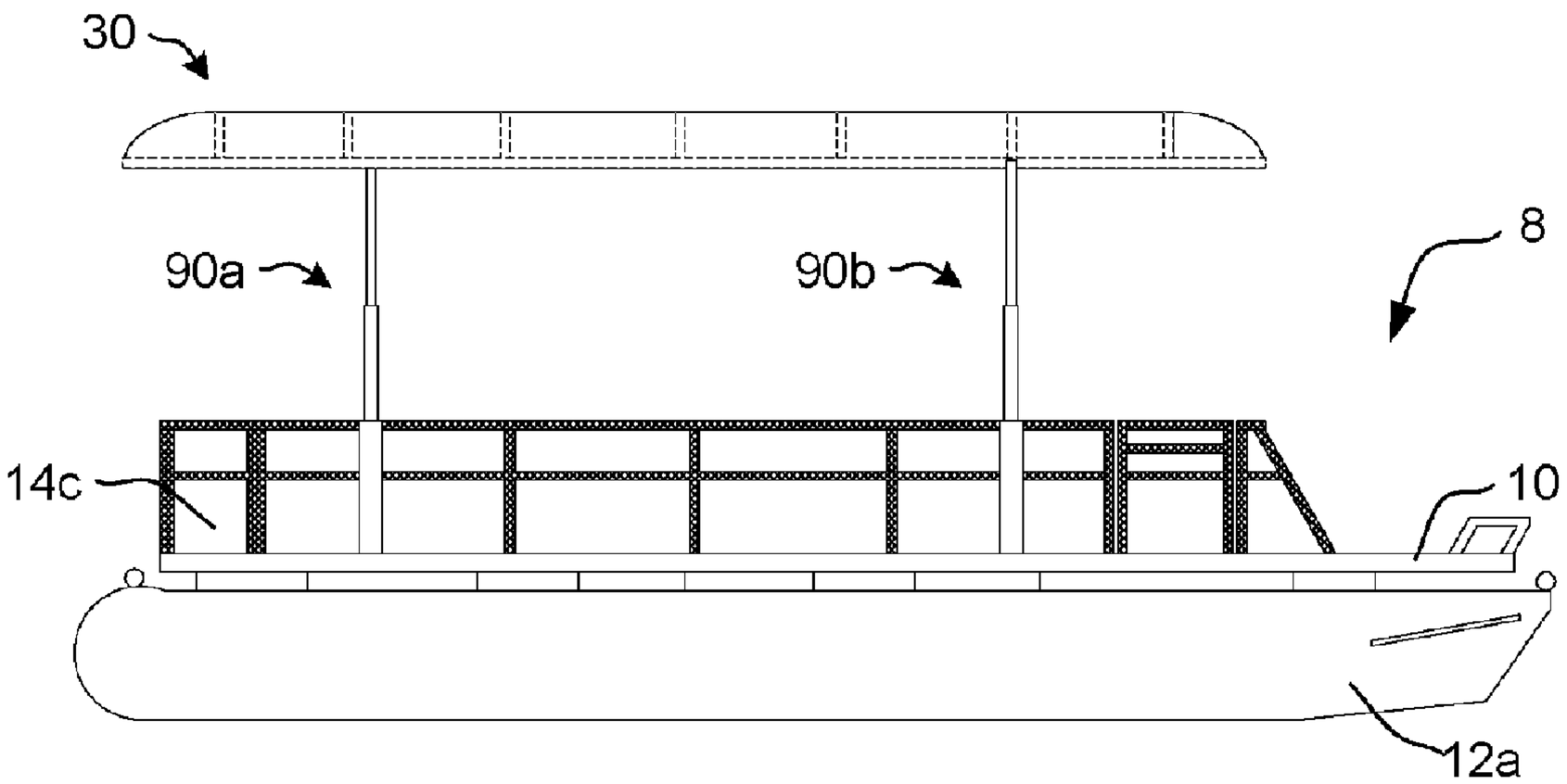


Figure 6A

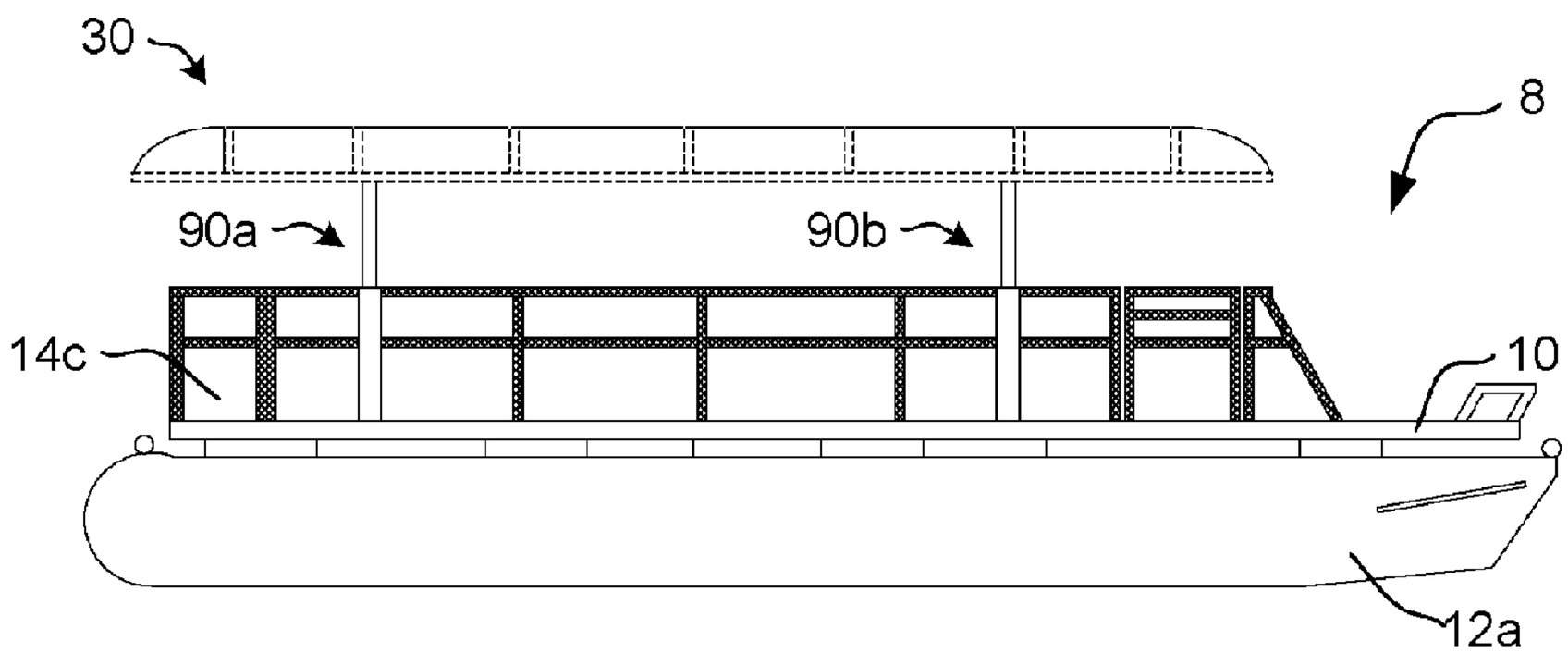


Figure 6B

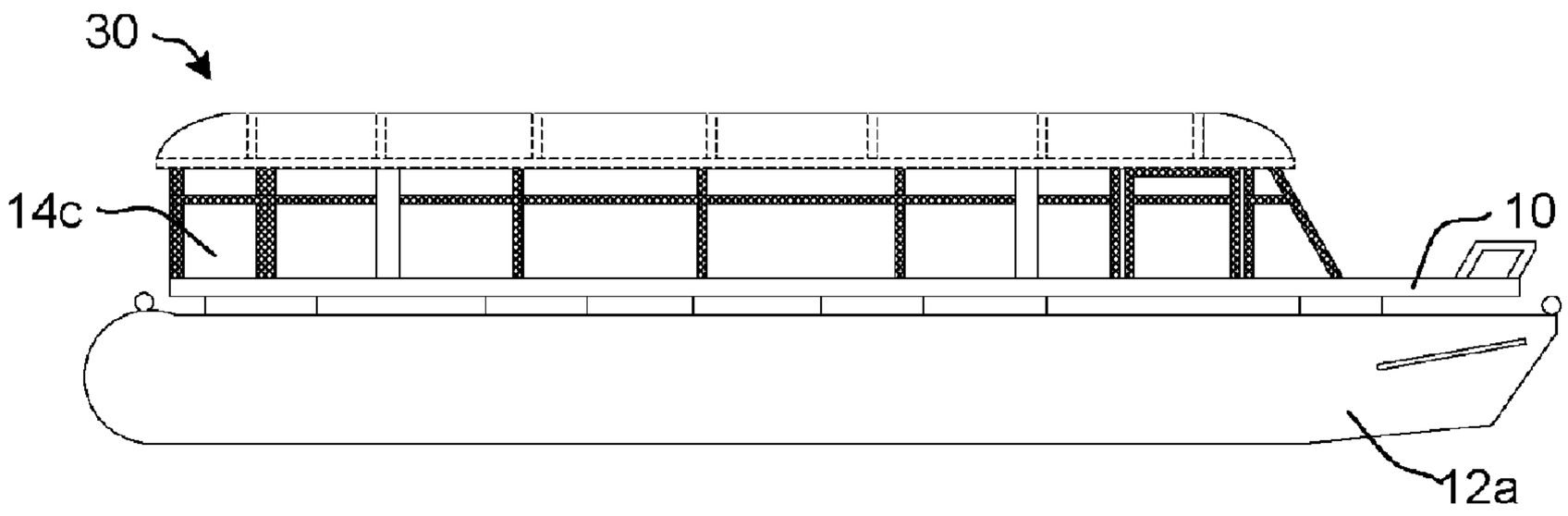


Figure 6C

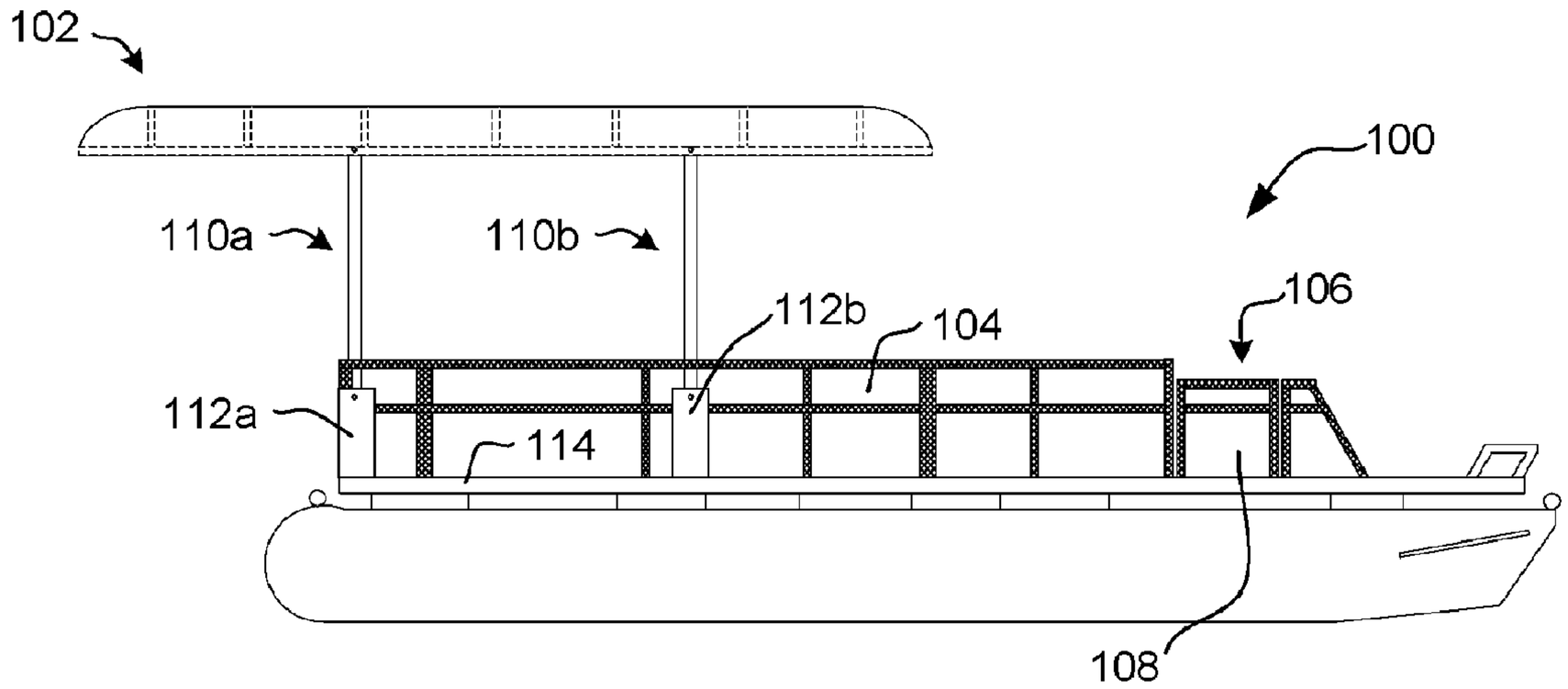


Figure 7A

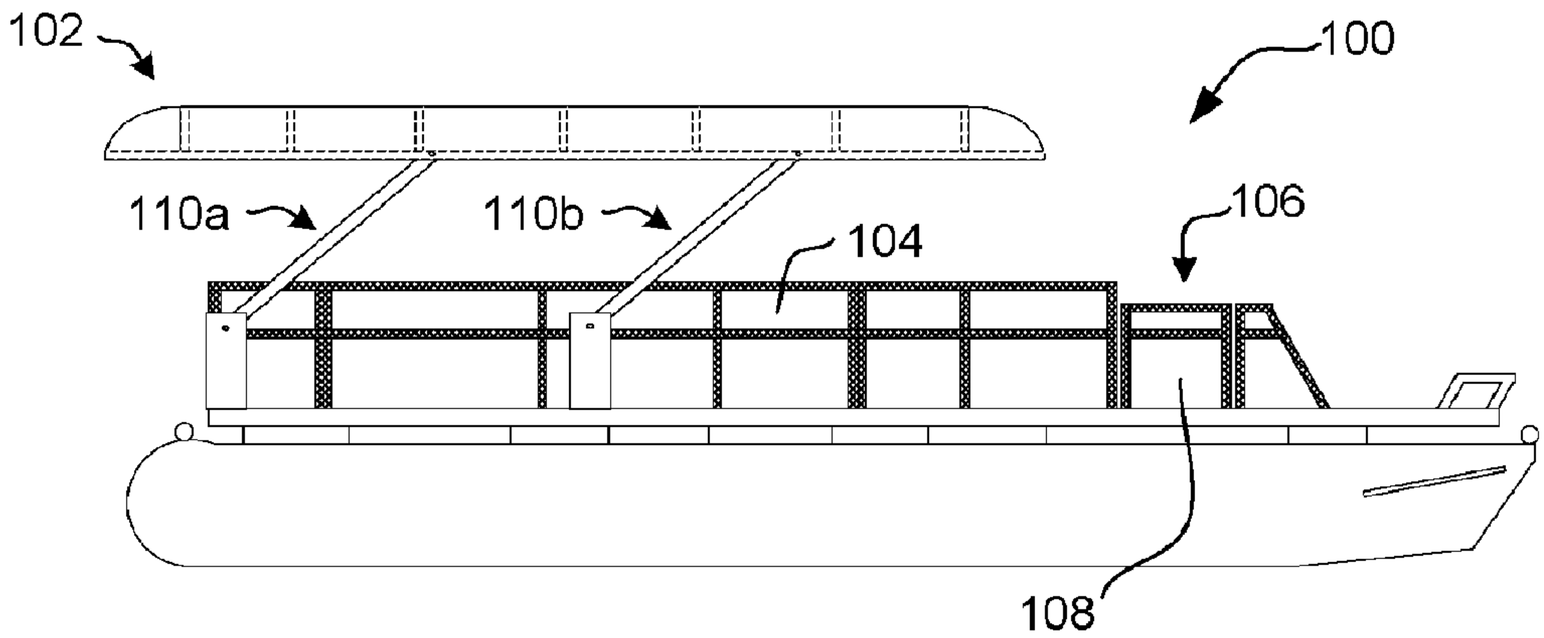


Figure 7B

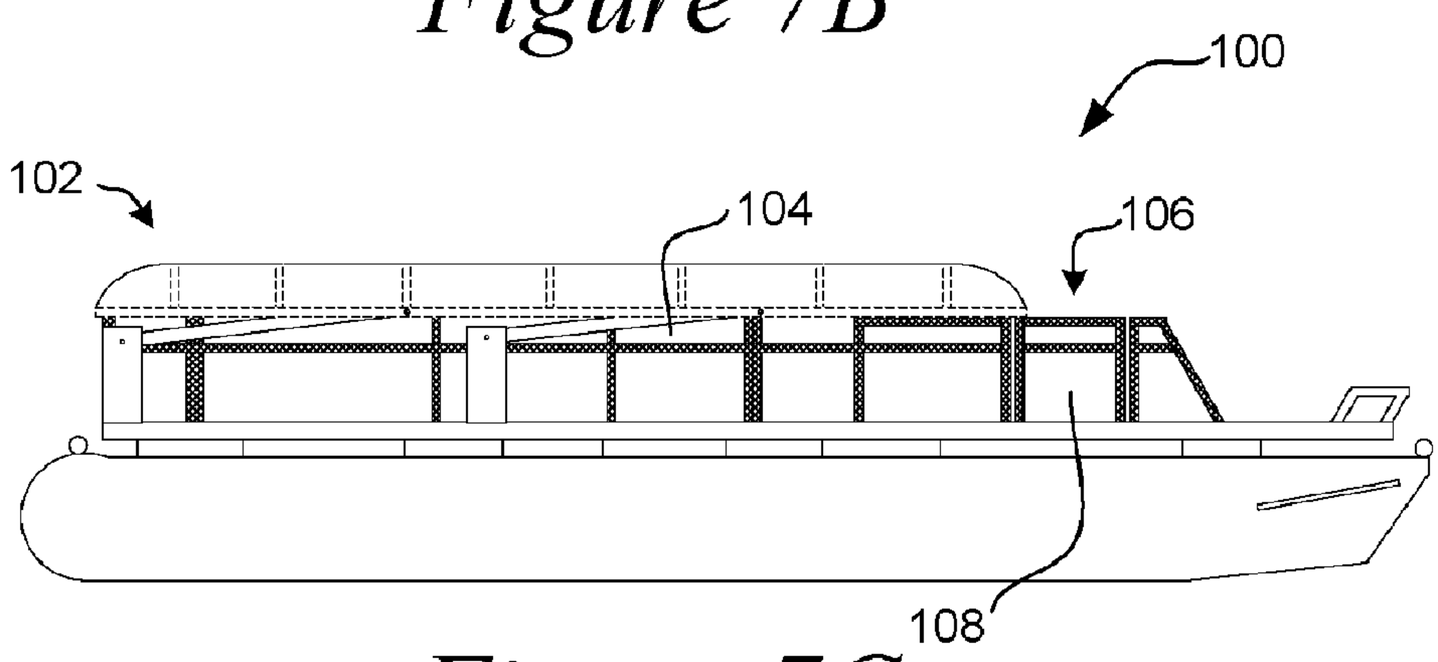


Figure 7C

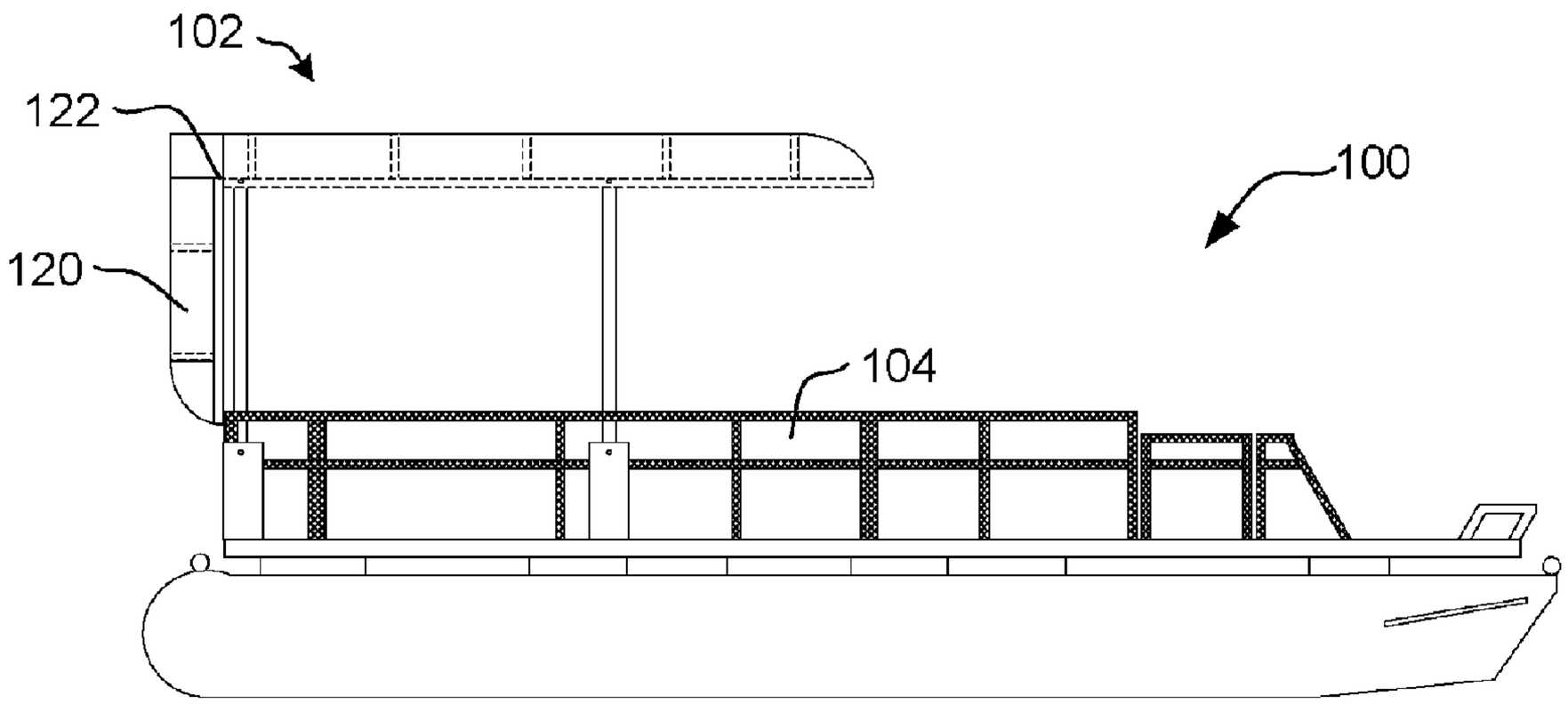


Figure 8

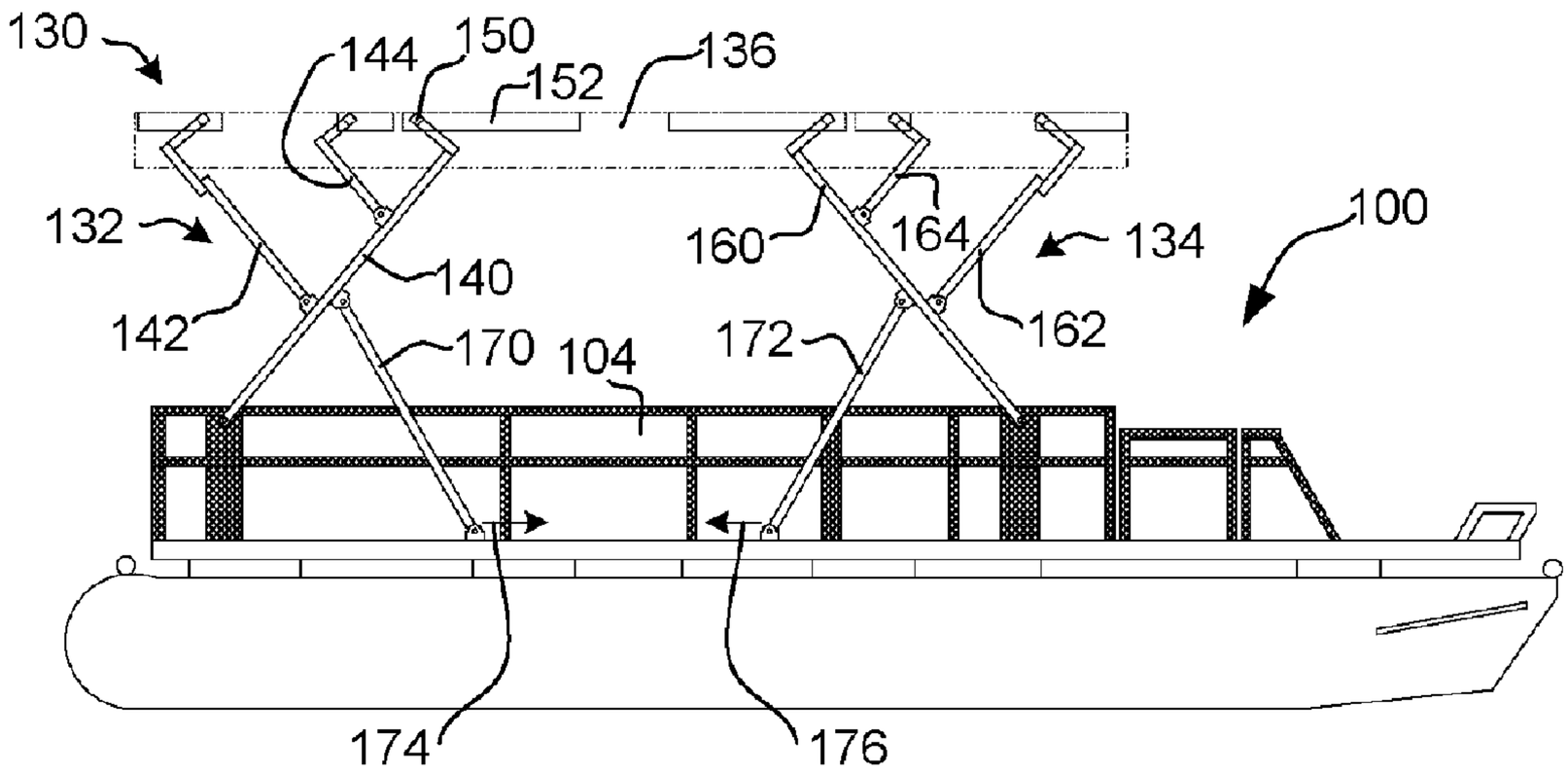


Figure 9A

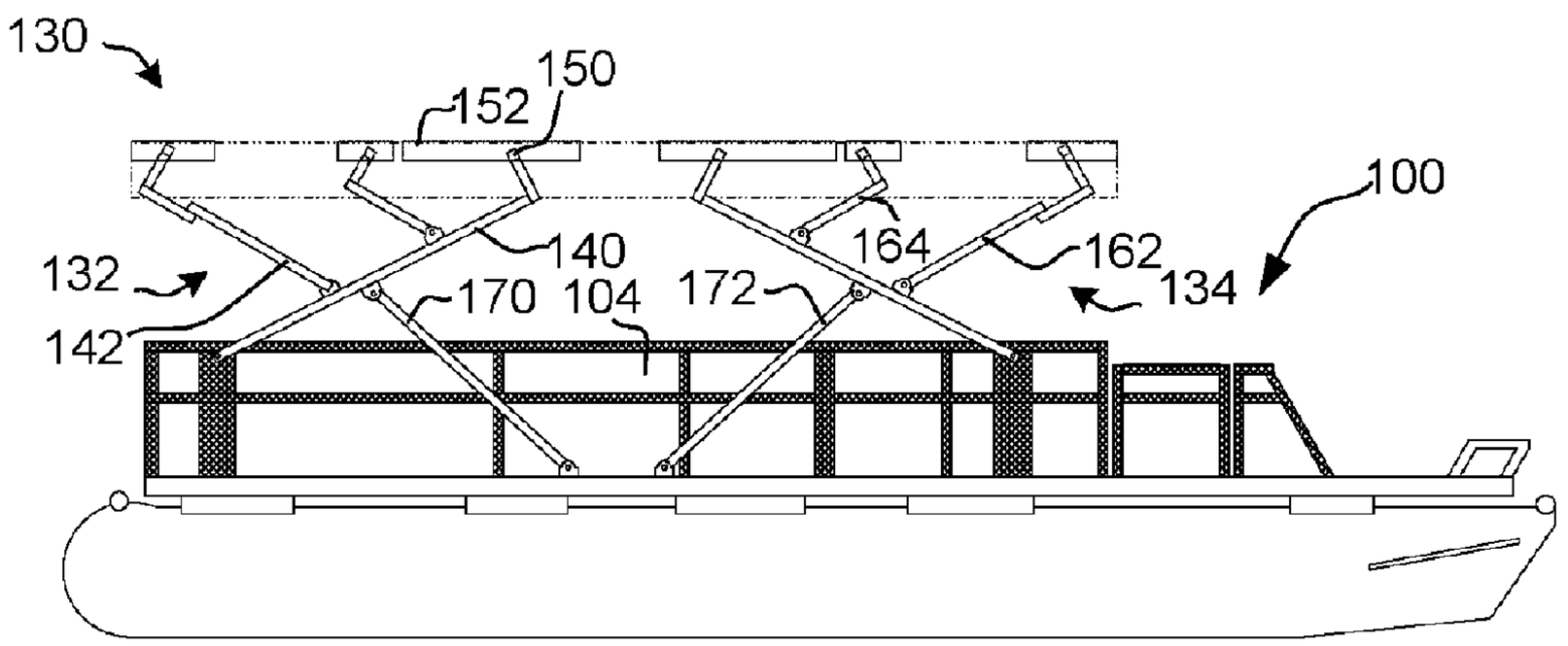


Figure 9B

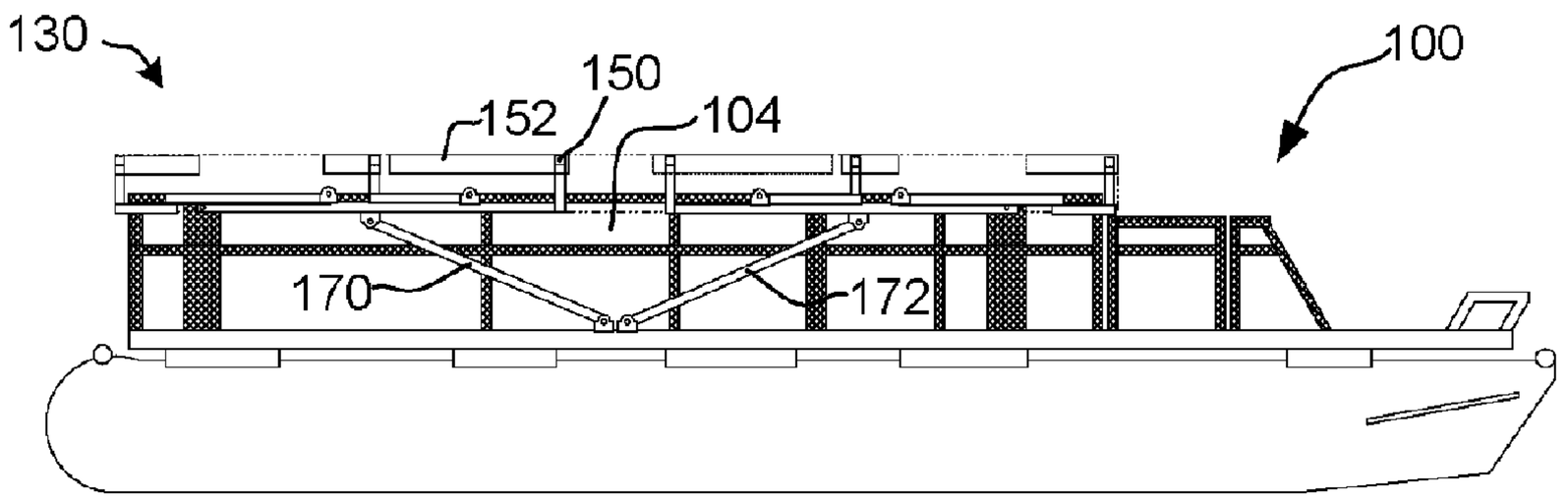


Figure 9C

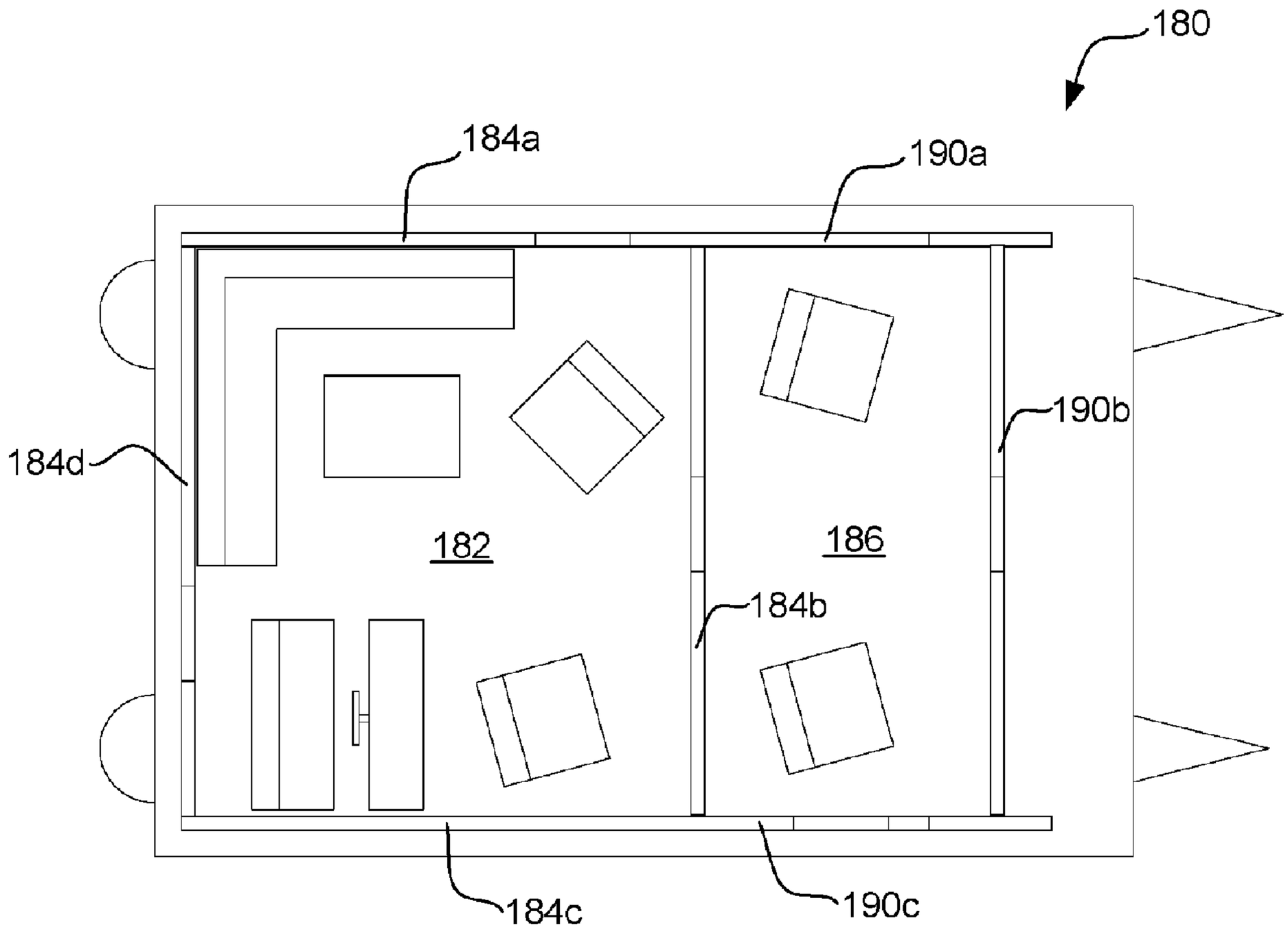


Figure 10

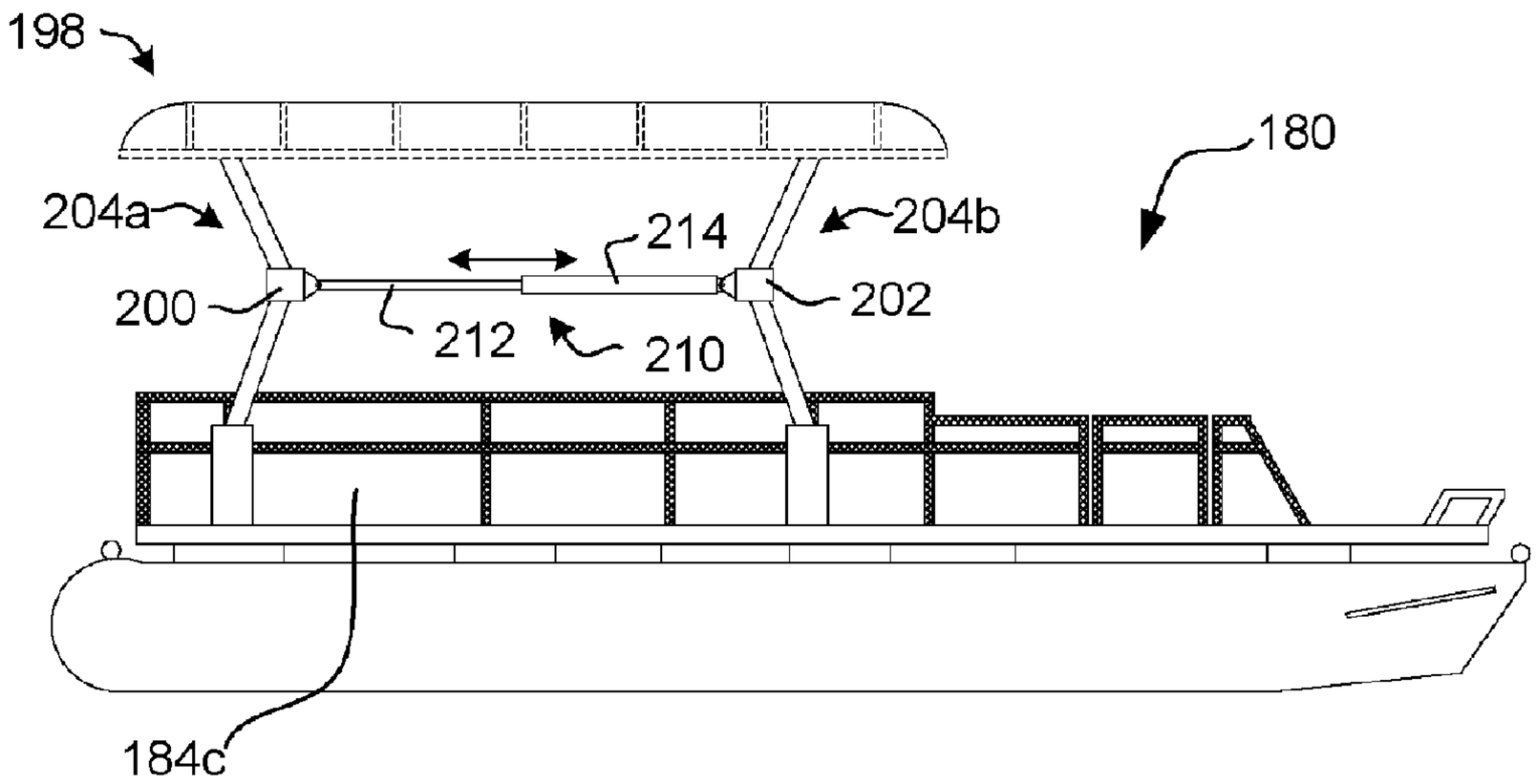


Figure 11A

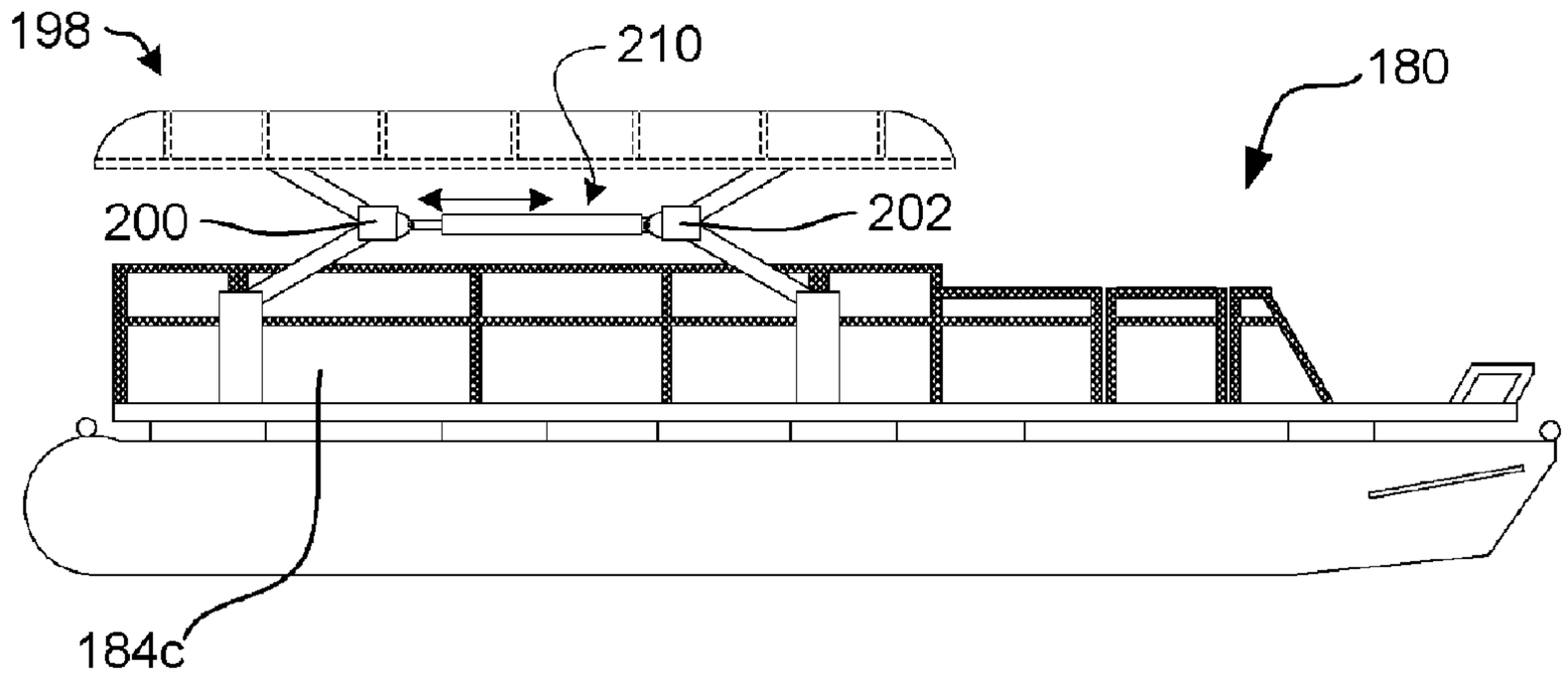


Figure 11B

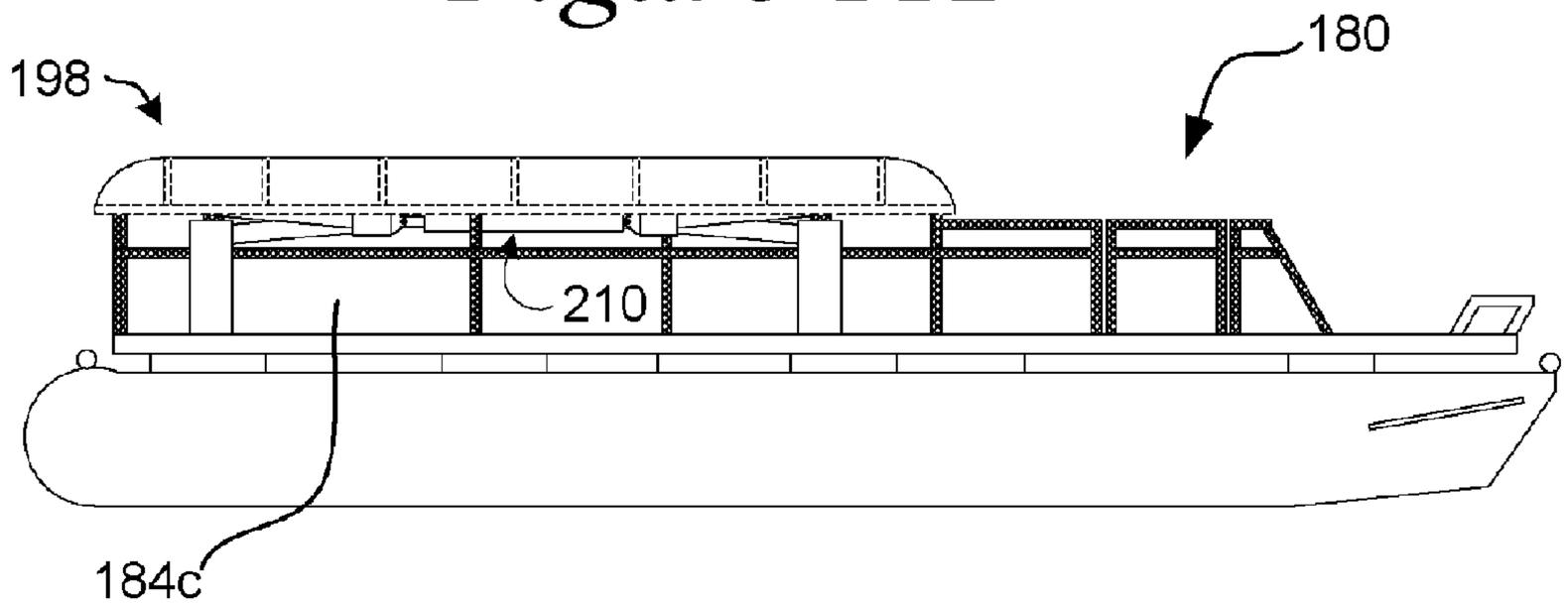


Figure 11C

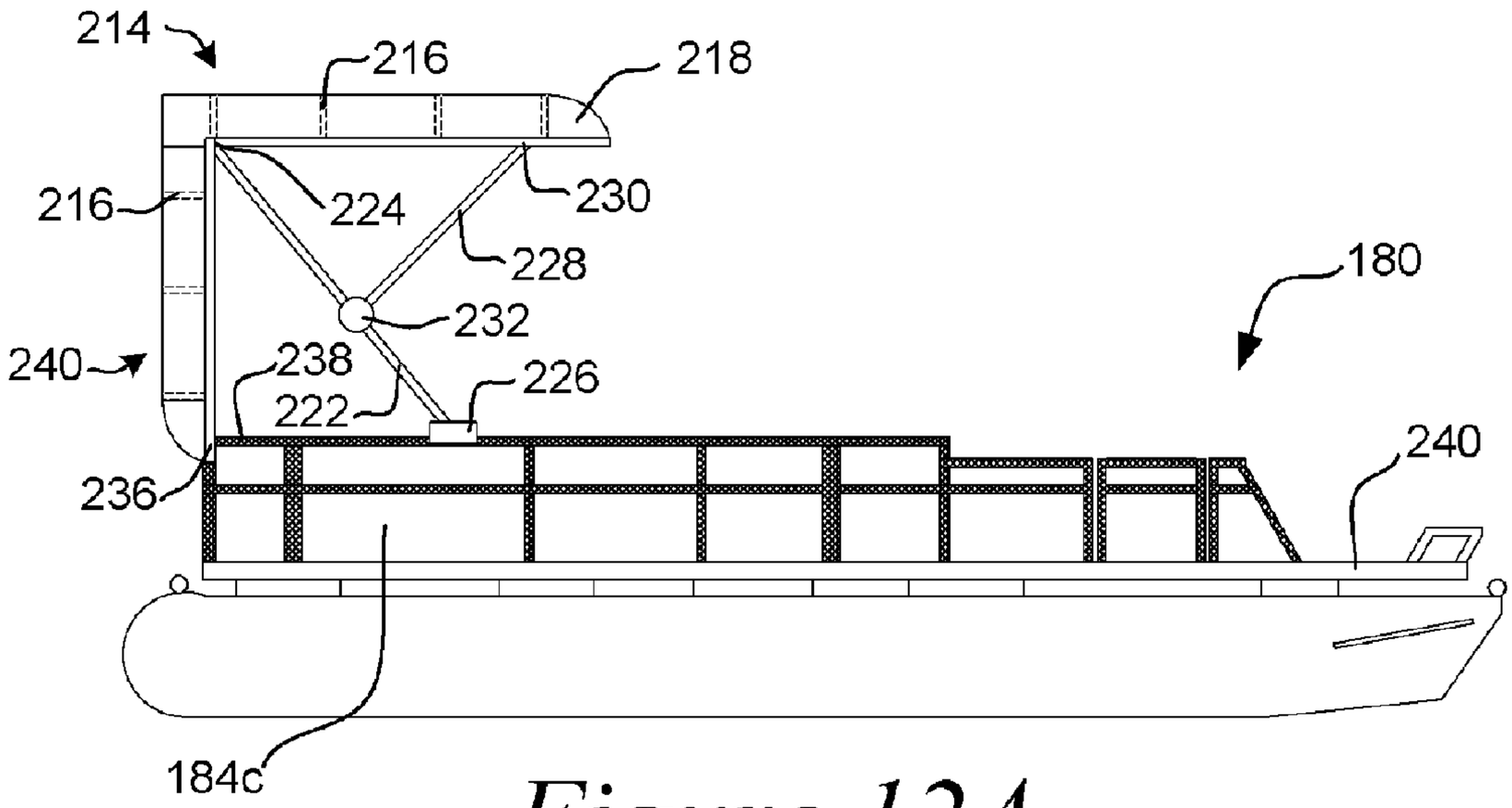


Figure 12A

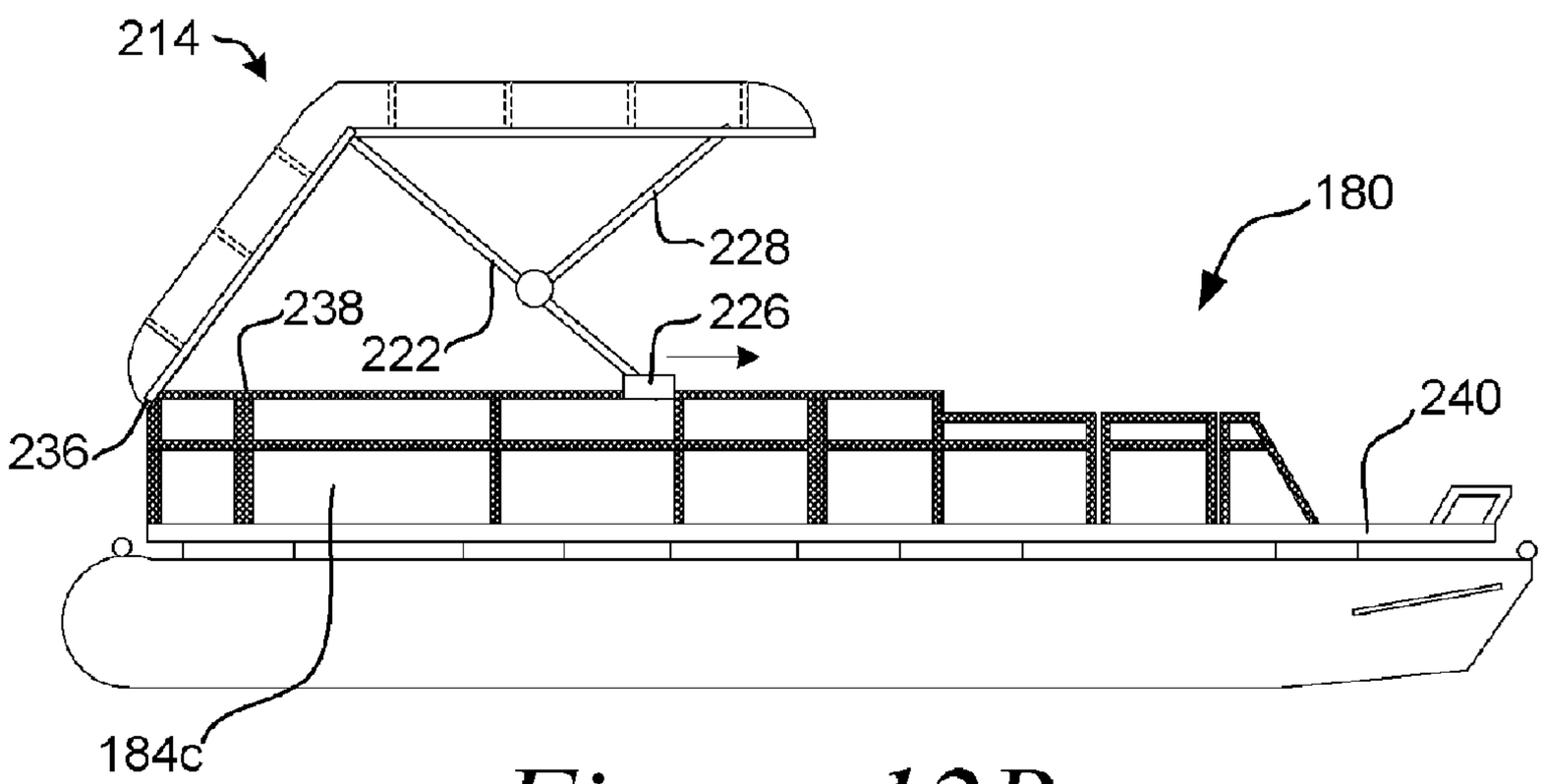


Figure 12B

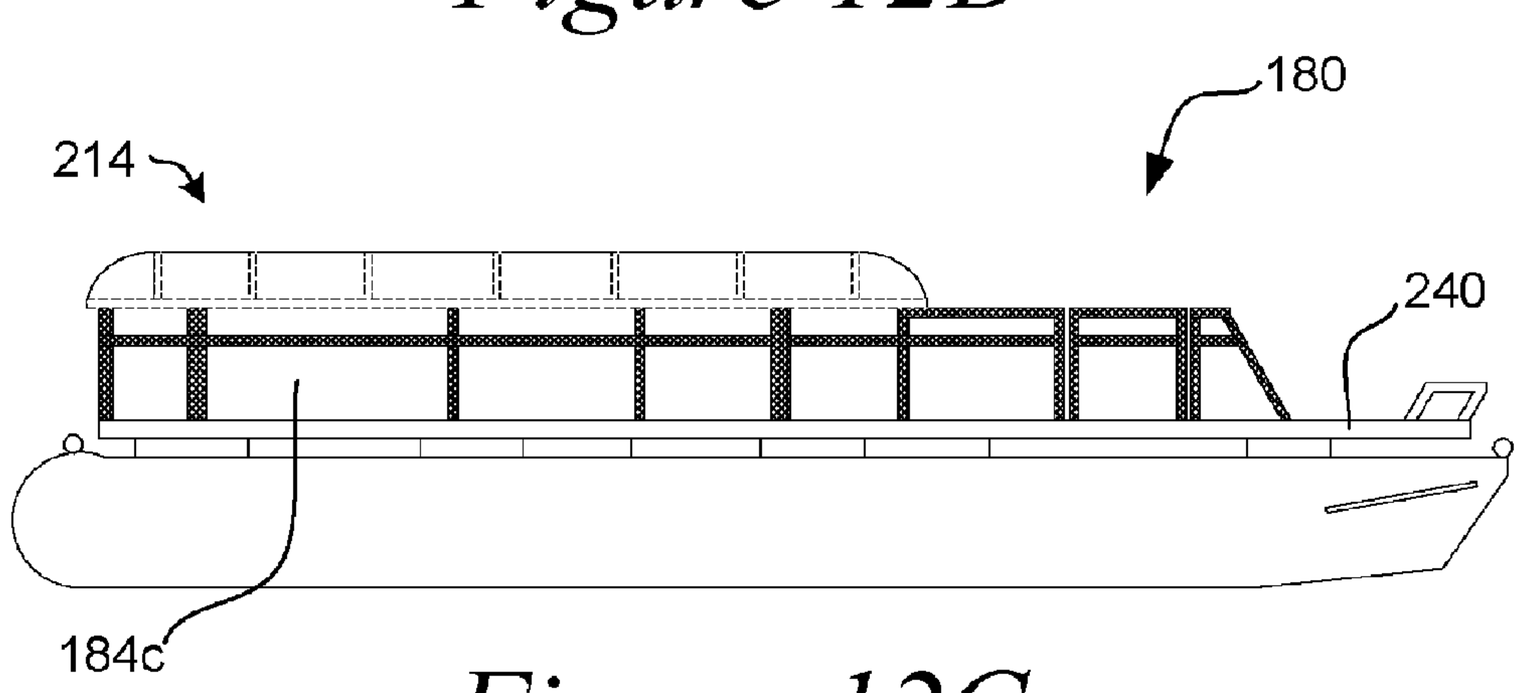


Figure 12C

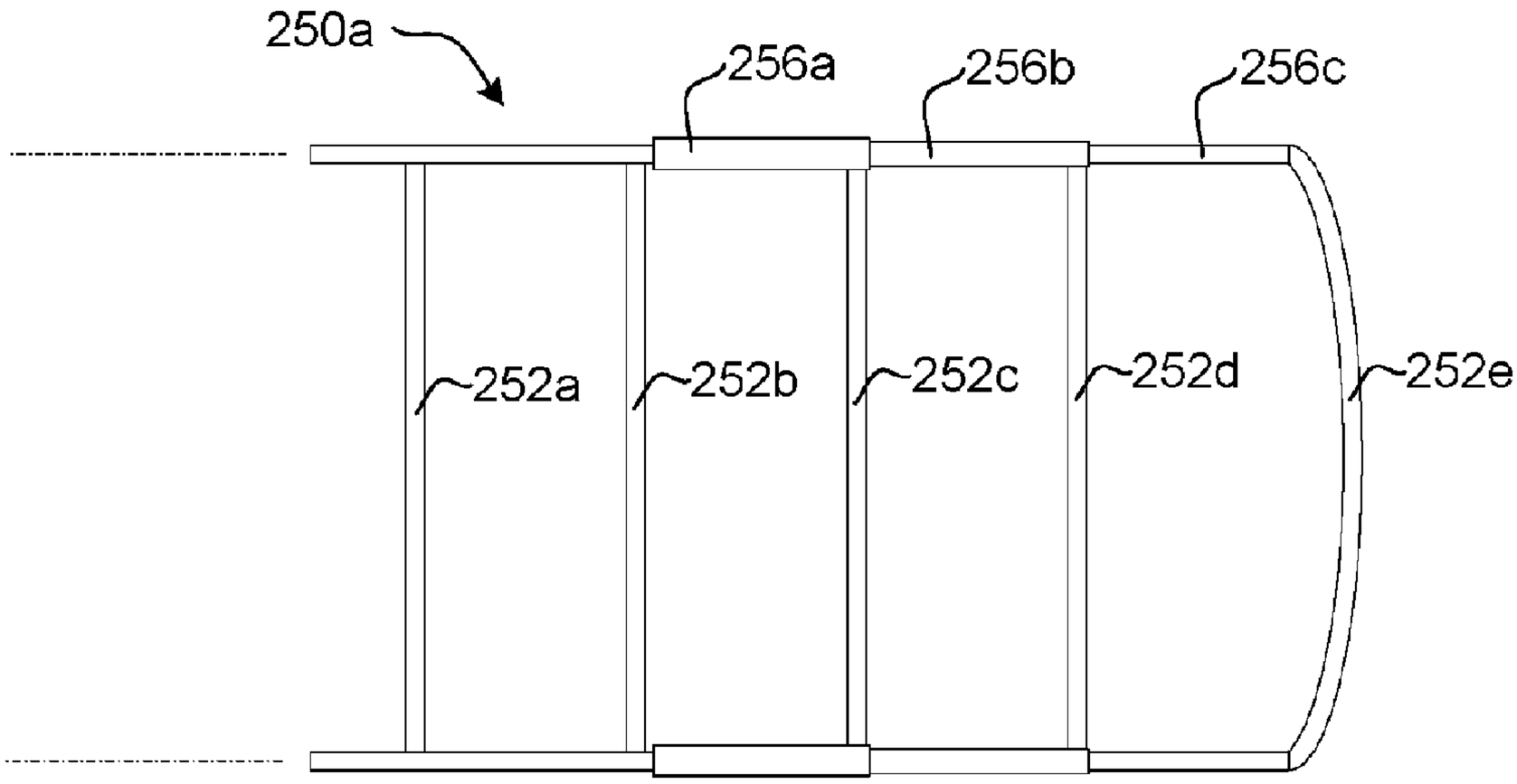


Figure 13A

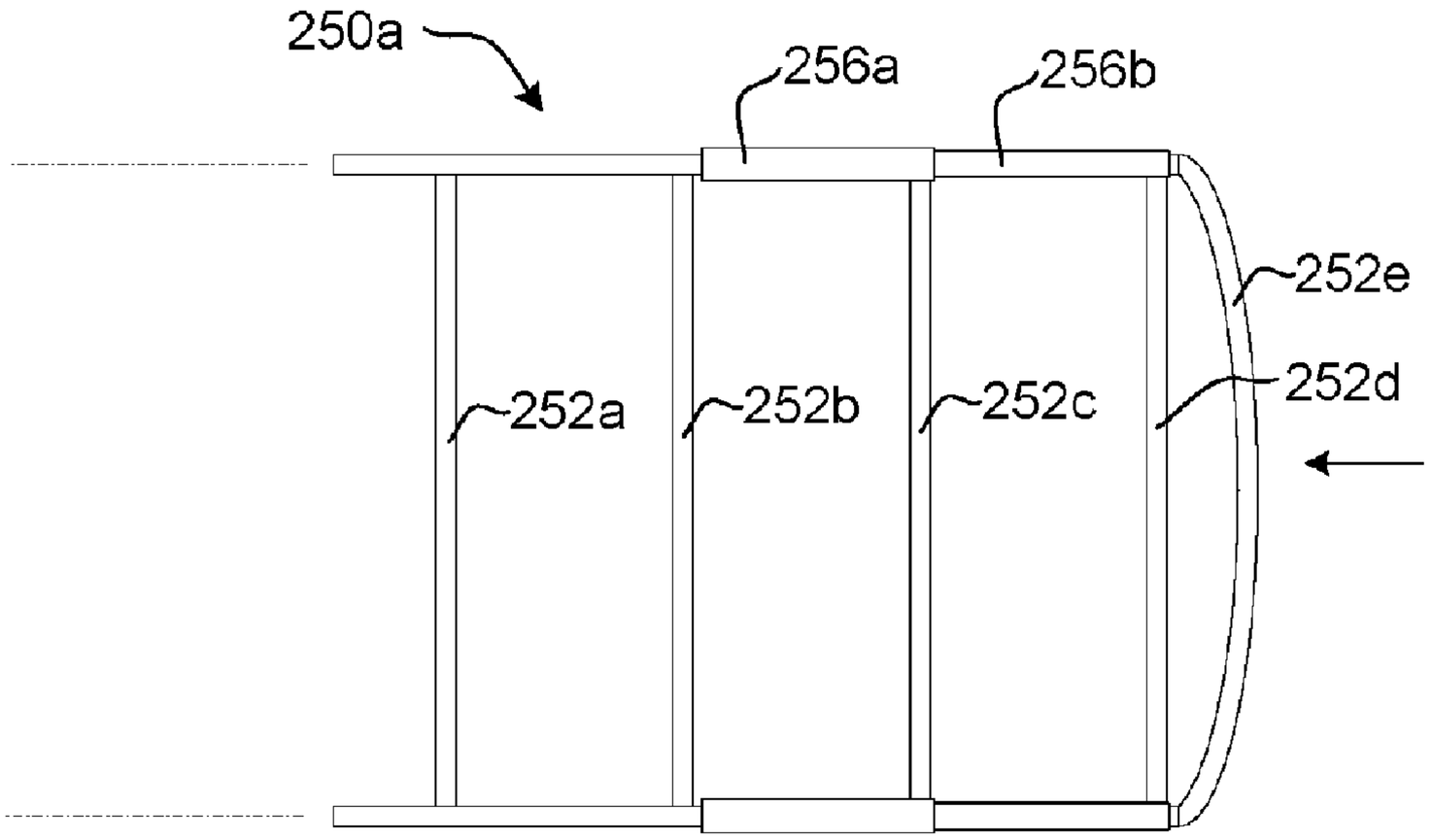


Figure 13B

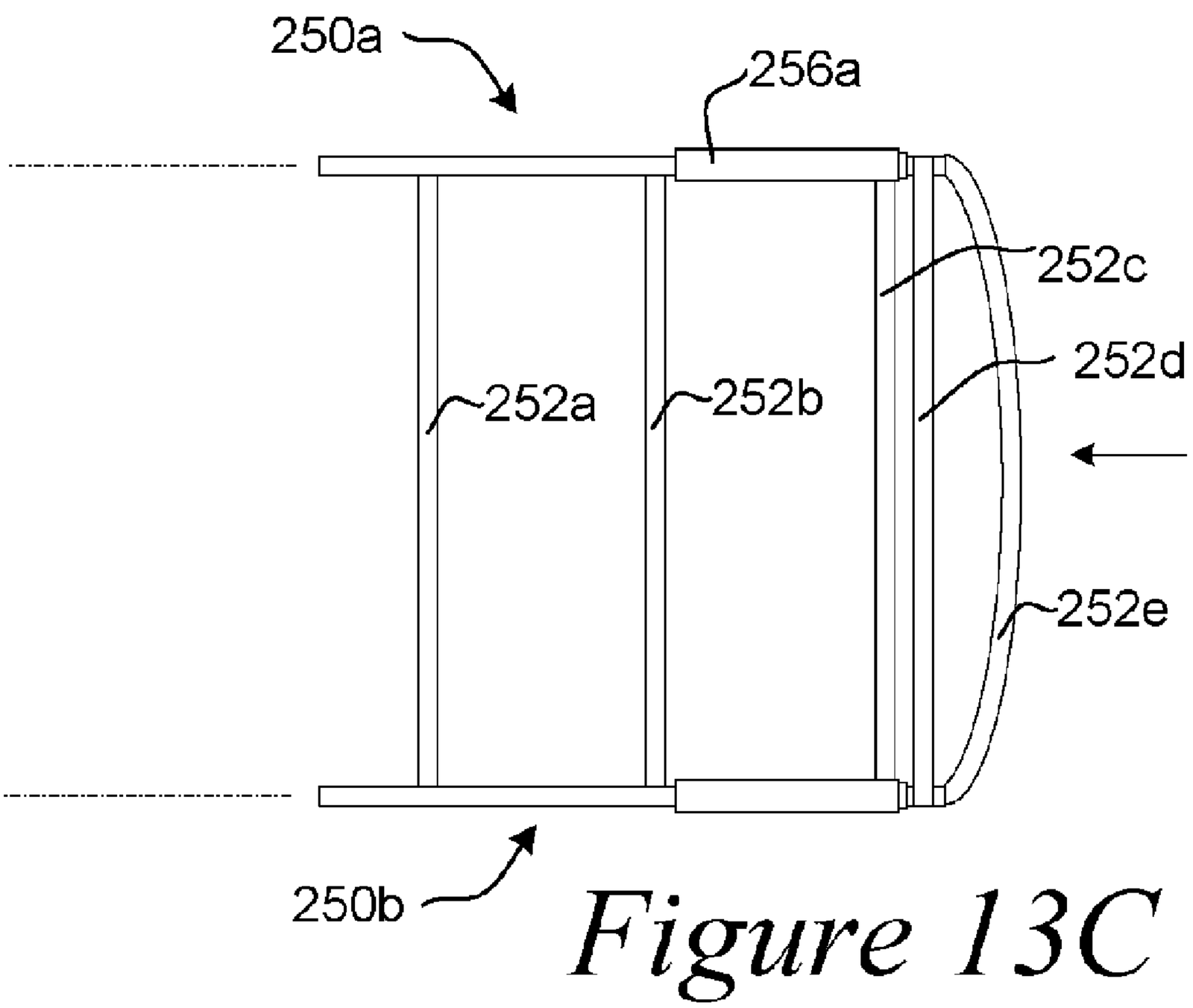


Figure 13C

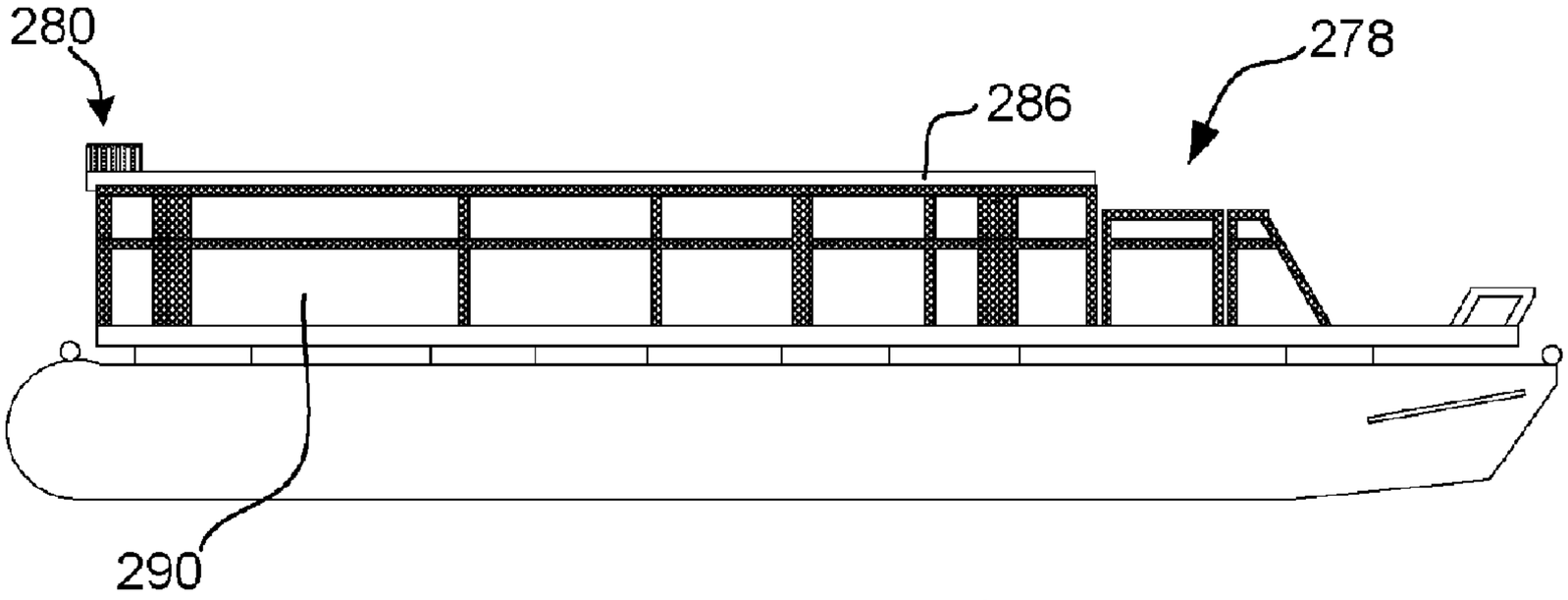


Figure 14A

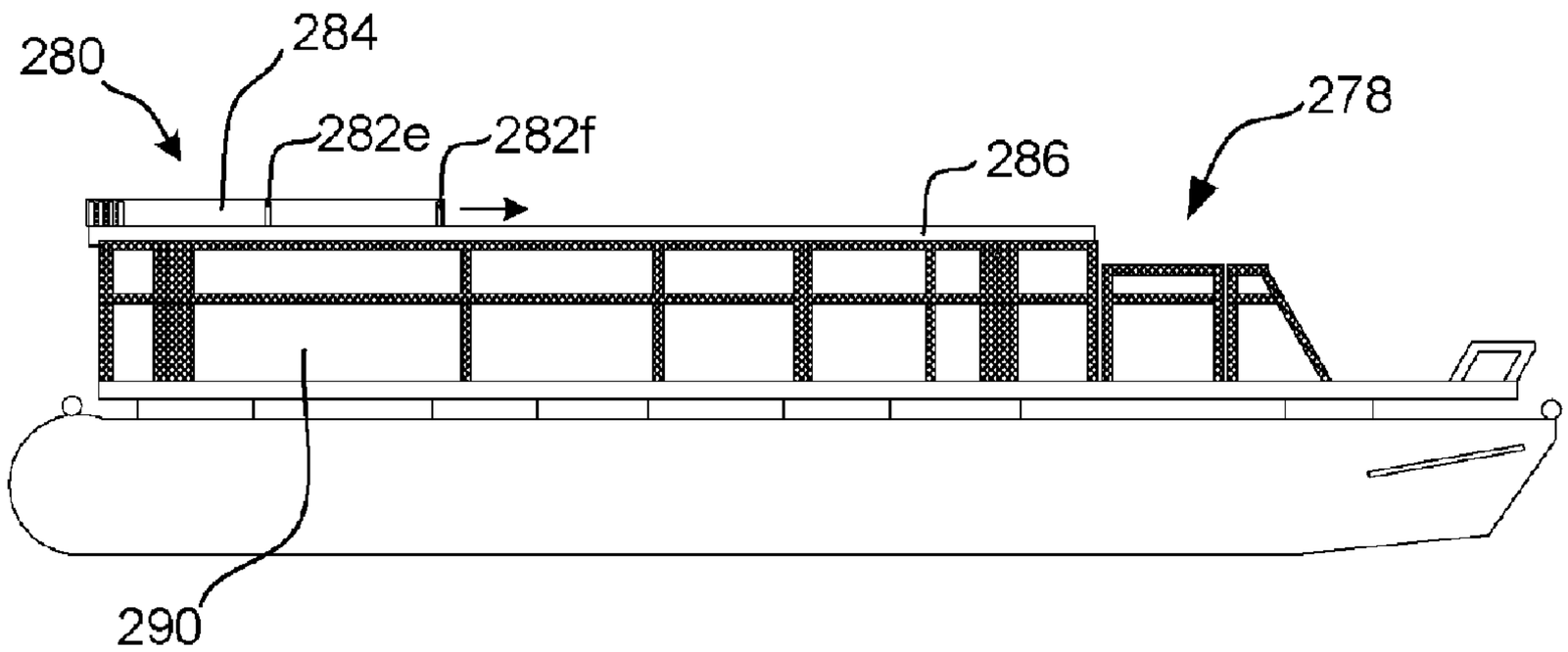


Figure 14B

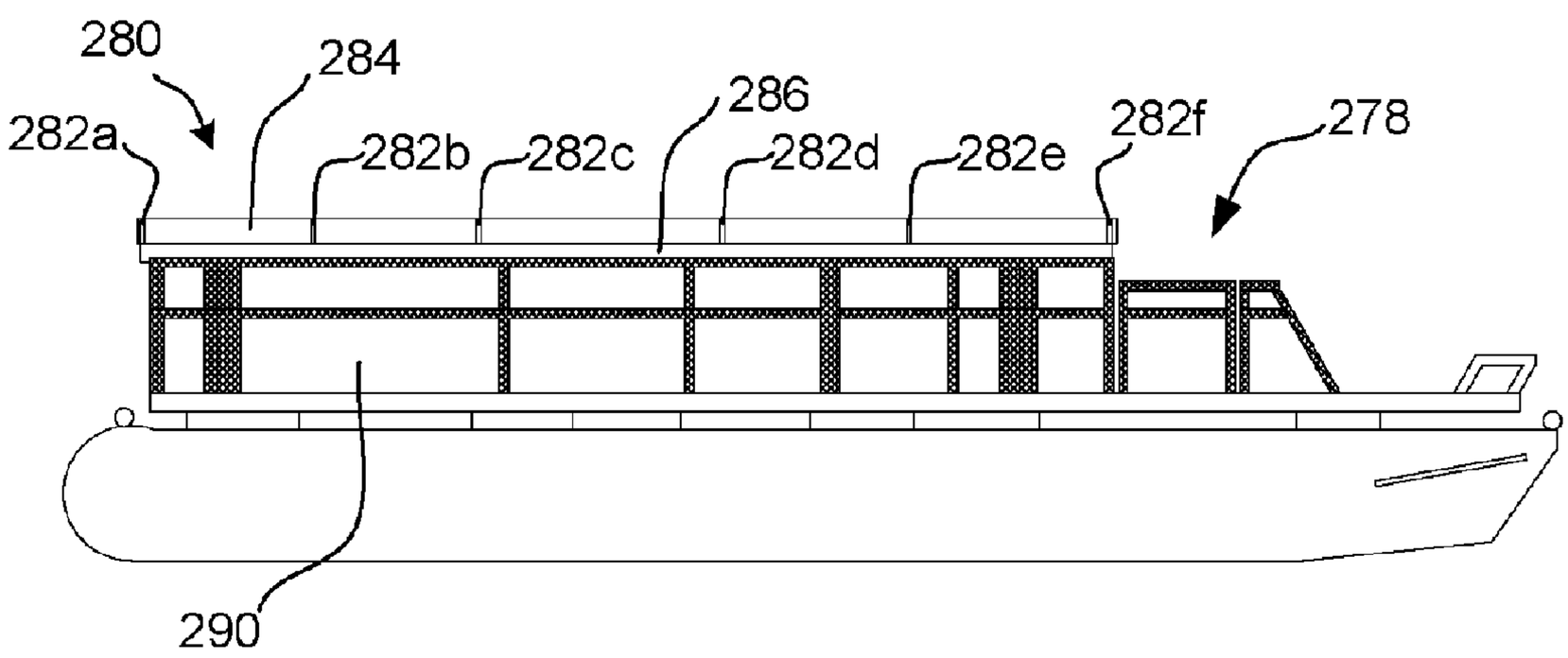


Figure 14C

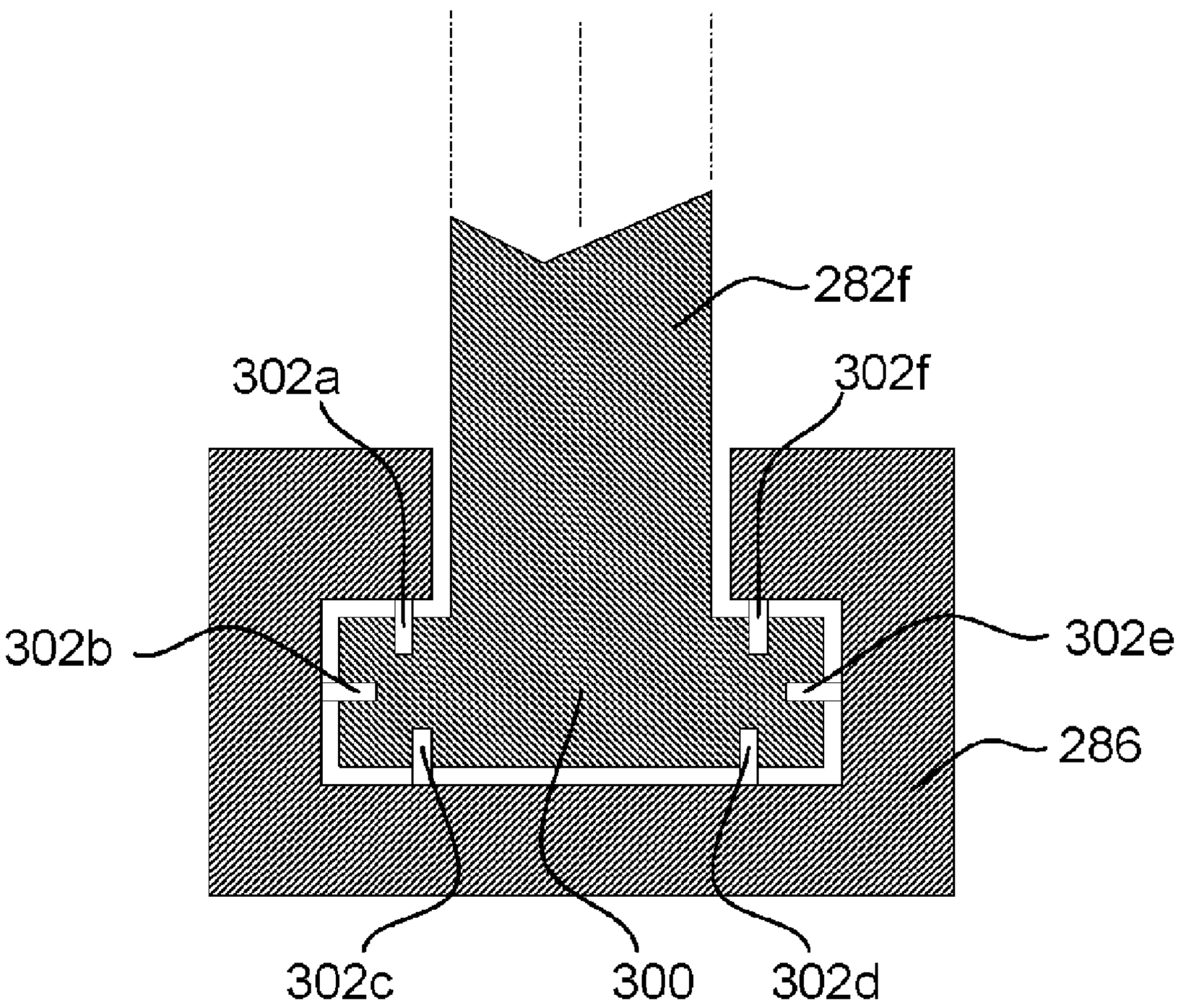


Figure 15

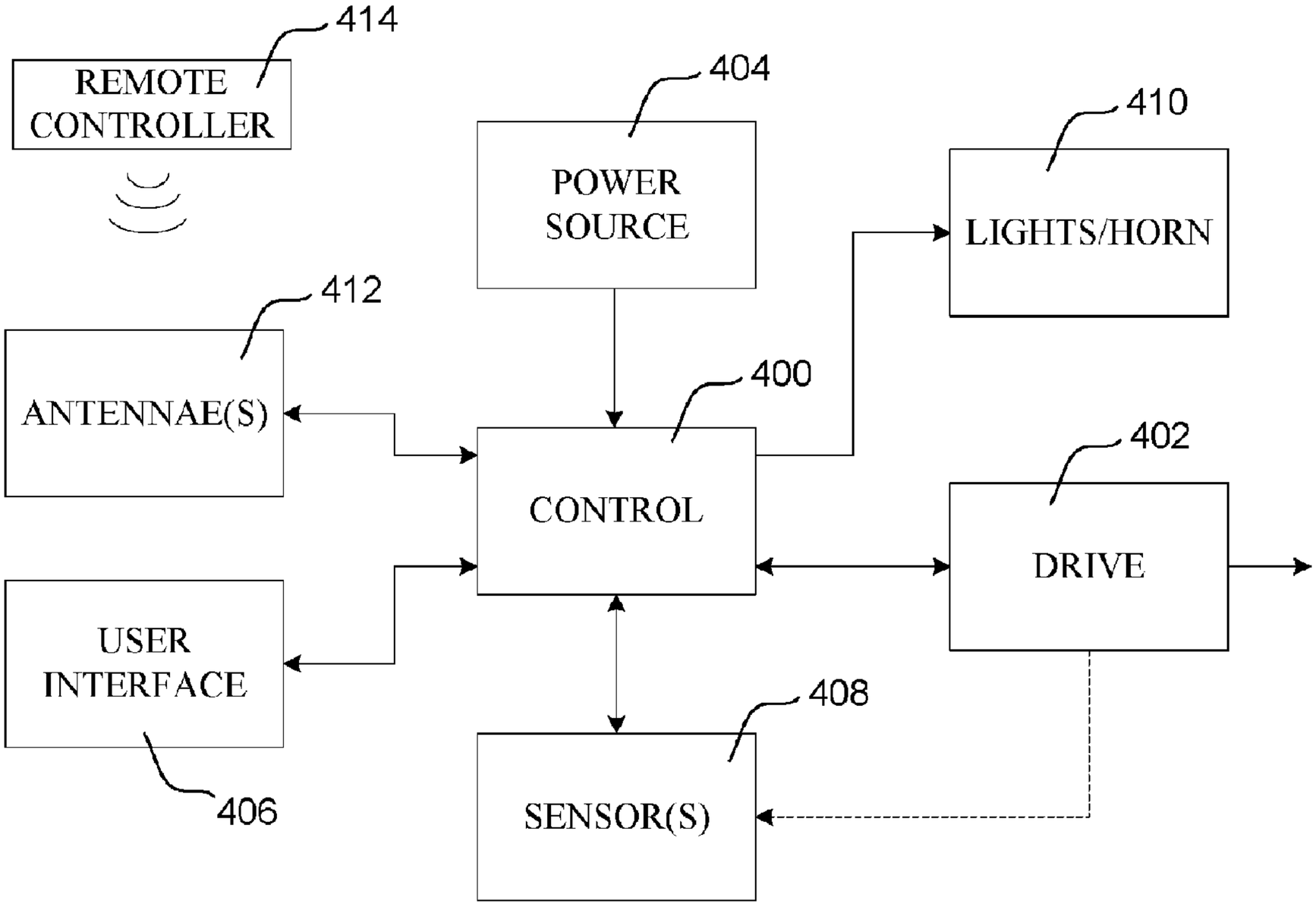

REMOTE CONTROLLER
414
POWER SOURCE
404
LIGHTS/HORN
410
ANTENNAE(S)
412
CONTROL
400
DRIVE
402
USER INTERFACE
406
SENSOR(S)
408

Figure 16

COVER SYSTEM FOR A BOAT

FIELD

The present invention relates to boats, and more particularly, to cover systems for boats.

BACKGROUND

Many forms of boat covers are known, some of which are simple, make-shift canvas or like covers sometimes of the button-on, button-off type. Such boat covers are typically manually installed by the user of the boat, and provide some level of protection to the interior of the boat while the boat is not in use.

When in use, some boats include a sun shade cover, often called a bimini top or the like, that provides some level of protection to the occupants of the boat from the sun. In many cases, a fabric cover is mounted on a tubular aluminum framework, which can be either fixed on the boat for convertible movement and/or pivoted between a shade providing position and a folded non-shade providing position. In the shade providing position, the sun shade cover is often suspended above the interior of the boat with open sides so that the occupants can move about and interior of the boat and see laterally out of the sides of the boat. In the folded non-shade providing position, the fabric cover is typically wrapped around the tubular aluminum framework, and the entire structure is pivoted out of the way to one side of the boat, typically towards the rear of the boat.

What would be desirable is a boat cover that can provide some level of protection to the interior of the boat when the boat is not in use, and can also provide some level of protection to the occupants of the boat from the sun and/or other elements when the boat is in use.

SUMMARY

The following summary is provided to facilitate an understanding of some of the innovative features unique to the present invention and is not intended to be a full description. A full appreciation of the invention can be gained by taking the entire specification, claims, drawings, and abstract as a whole.

The present invention relates to a boat cover system that may provide some level of protection to the interior of the boat when the boat is not in use, and also some level of protection to the occupants of the boat from the sun, rain and/or other elements when the boat is in use. In some illustrative embodiments, the boat cover system includes a cover assembly that can be moved between a raised position and a lowered position, wherein in the lowered position, the cover assembly provides some level of protection to the interior of the boat when the boat is not in use, and in the raised position, the cover assembly provides some level of protection to the occupants of the boat from the sun, rain and/or other elements when the boat is in use.

In some embodiments, the boat cover system may be used in conjunction with a boat that includes a platform (e.g. floor), with side walls extending up from the platform around a perimeter of a protected area. The cover assembly may include a support frame and a cover, wherein the support frame supports the cover. One or more cover supports may be provided for supporting the cover assembly above the platform. In addition, the one or more cover supports may be adapted to allow the cover assembly to be moved between a raised position and a lowered position. In the lowered position, a perimeter of the cover assembly may extend laterally out to at least the side walls of the boat to provide a cover for all or substantially all of the desired protected area. In some cases, the perimeter of the cover assembly may extend laterally out past the side walls of the boat, and in some cases, overlap in a vertical direction a top portion of the one or more side walls, but this is not required in all embodiments. In the raised position, the cover assembly may provide shade to occupants in at least part of the protected area from the sun or the like. In the lowered position, the cover assembly may cover and help prevent sun, rain, debris and/or other elements or objects from entering the protected area of the boat when the boat is not in use.

It is contemplated that the cover assembly may be moved between the lowered position and the raised position in any number of ways. In some cases, the cover assembly can be moved between the lowered position and the raised position under human power. A crank, a wench, simply pushing and/or pulling the cover assembly, and/or using any other suitable human powered moving mechanism or method may be employed. Springs or compressed cylinders may be provided to assist in the raising and/or lowering of the cover assembly, if desired. In other cases, the cover assembly can be moved between the lowered position and the raised position using a powered system, such as a motor or pump. When a motor or pump is used, motion and/or energy from the motor or pump may be transferred to move the cover assembly using one or more belts, cables, screw drives, shafts, hydraulic cylinders, pulleys, gears, tubes and/or any other suitable system or method, as desired.

In some cases, the support frame of the cover assembly may include an extended configuration and a retracted configuration, wherein the cover assembly can be selectively changed from the extended configuration to the retracted configuration. In the retracted position, the cover assembly may cover less of the interior of the boat, which may be particularly desirable when the cover assembly is in the raised position, but this is not required in all embodiments. In the extended configuration, the cover assembly may cover more of the interior of the boat, which may be particularly desirable when the cover assembly is in the lowered position and adapted to protect all or substantially all of a protected area of the boat.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects of the present invention and many of the attendant advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. **1** is a schematic top view of an illustrative pontoon boat;

FIG. **2**A is a schematic side view of a pontoon boat, with a cover assembly in a raised position;

FIG. **2**B is a schematic side view of the pontoon boat of FIG. **2**A, with the cover assembly in an intermediate position;

FIG. **2**C is a schematic side view of the pontoon boat of FIG. **2**A, with the cover assembly in a lowered position;

FIG. **3** is a schematic cross-sectional side view of a cover system that extends to the side wall of a boat;

FIG. **4** is a schematic cross-sectional side view of a cover system that extends out laterally past the side walls of a boat, and overlaps the side wall in a vertical direction;

FIG. **5**A is a schematic side view of one illustrative drive mechanism for the cover assembly of FIG. **2**A-**2**C, with the cover system in the lowered position;

FIG. **5**B is a schematic side view of the illustrative drive mechanism of FIG. **5**A, with the cover system in the raised position;

FIG. **6**A is a schematic side view of another illustrative pontoon boat, with a cover assembly in a raised position;

FIG. **6**B is a schematic side view of the pontoon boat of FIG. **6**A, with the cover assembly in an intermediate position;

FIG. **6**C is a schematic side view of the pontoon boat of FIG. **6**A, with the cover assembly in a lowered position;

FIG. **7**A is a schematic side view of another illustrative pontoon boat, with a cover assembly in a raised position;

FIG. **7**B is a schematic side view of the pontoon boat of FIG. **7**A, with the cover assembly in an intermediate position;

FIG. **7**C is a schematic side view of the pontoon boat of FIG. **7**A, with the cover assembly in a lowered position;

FIG. **8** is a schematic side view of the pontoon boat of FIG. **7**A, with the cover assembly in the raised position and with a portion of the cover system folded down;

FIG. **9**A is a schematic side view of another illustrative pontoon boat, with a cover assembly in a raised position;

FIG. **9**B is a schematic side view of the pontoon boat of FIG. **9**A, with the cover assembly in an intermediate position;

FIG. **9**C is a schematic side view of the pontoon boat of FIG. **9**A, with the cover assembly in a lowered position;

FIG. **10** is a schematic top view of another illustrative pontoon boat with a smaller protected area defined by side walls;

FIG. **11**A is a schematic side view of another illustrative pontoon boat, with a cover assembly in a raised position;

FIG. **11**B is a schematic side view of the pontoon boat of FIG. **11**A, with the cover assembly in an intermediate position;

FIG. **11**C is a schematic side view of the pontoon boat of FIG. **11**A, with the cover assembly in a lowered position;

FIG. **12**A is a schematic side view of another illustrative pontoon boat, with a cover assembly in a raised position;

FIG. **12**B is a schematic side view of the pontoon boat of FIG. **12**A, with the cover assembly in an intermediate position;

FIG. **12**C is a schematic side view of the pontoon boat of FIG. **12**A, with the cover assembly in a lowered position;

FIG. **13**A is a schematic top view of a cover assembly in an extended position;

FIG. **13**B is a schematic top view of a cover assembly in an intermediate extended position;

FIG. **13**C is a schematic top view of a cover assembly in a retracted position;

FIG. **14**A is a schematic side view of another illustrative pontoon boat, with a cover assembly in retracted storage position;

FIG. **14**B is a schematic side view of the pontoon boat of FIG. **14**A, with the cover assembly in an intermediate position;

FIG. **14**C is a schematic side view of the pontoon boat of FIG. **14**A, with the cover assembly in an extended covering position;

FIG. **15** is a schematic cross-sectional side view of a track and a movable support member; and

FIG. **16** is a schematic block diagram of a control system for a movable cover system for a boat.

DETAILED DESCRIPTION

The following description should be read with reference to the drawings wherein like reference numerals indicate like elements throughout the several views. The detailed description and drawings show several illustrative embodiments which are meant to be illustrative of the present invention.

For illustration purposes, a pontoon boat is used as an example in the Figures and examples provided below. It is contemplated, however, that the present invention may be used in conjunction with any type of boat including recreational speed type boats, fishing boats of all sizes, cruisers, and/or any other type of boat, as desired.

FIG. **1** is a schematic top view of an illustrative pontoon boat. The illustrative pontoon boat is generally shown at **8**, and includes a platform **10** that is positioned above and attached to two (or more) spaced pontoon floats **12***a* and **12***b*. The spaced pontoon floats **12***a* and **12***b* provide floatation for the pontoon boat **8**.

One or more side walls, such as side walls **14***a*-**14***d*, may extend up from the platform **10** around a perimeter of a protected area **16**. In the illustrative embodiment, the protected area **16** is defined by the side walls **14***a*-**14***d*. In some cases, some or all of the side walls **14***a*-**14***d* may include a door, such as doors **16***a*-**16***d*. The doors **16***a*-**16***d* may help provide access to/from the protected area **16** of the pontoon boat **8**.

One or more seats, tables, sinks, bathrooms, control consoles, wet bars or the like may be provide in the protected area. In the illustrative embodiment, seats **20***a*-**20***d*, a table **22** and a control console **24** including a steering wheel **26** are provided in the protected area **16**. These, however, are only illustrative. The protected area may also be carpeted in some cases.

In many cases, it is desirable to cover the protected area to help prevent sun, rain, debris and/or other elements or objects from entering the protected area of the pontoon boat **8** when the pontoon boat **8** is not in use. If the protected area is not covered, the sun may cause the seats **20***a*-**20***d*, table **22**, control console **24** and carpet to deteriorate faster. Also, rain may cause the seats **20***a*-**20***d* and other objects in the protected area **16** to become wet, which may be uncomfortable to the users of the boat when the boat is eventually used. Dust, dirt, debris, seedlings and other objects may also enter the protected area **16**, which may require extensive cleaning by the boat user prior to its use.

As such, it is often desirable to cover the protected area when the boat is not in use. Currently, this is typically done by manually fitting a tarp or the like over the protected area and securing the edges of the tarp to the side walls. One or more support poles are sometimes manually positioned between the platform **10** and the middle of the tarp to help prevent sagging of the tarp, which if not addressed, can collect water. The process of manually fitting the tarp over the protected area after each boat use, and removing and storing the tarp prior to each boat use, can be a fairly laborious and tedious task. This sometimes causes the boat user to not use the pontoon boat **18** as much as he/she would like, particularly for shorter excursions or outings.

FIG. **2**A-**2**C are schematic side view drawings of the pontoon boat **8** of FIG. **1**, fitted with a boat cover system **30** in accordance with one illustrative embodiment of the present invention. In the illustrative embodiment, the side walls **14***a*-**14***d* extend up from the platform and include one or more support members, such as support member **28**. In some cases, one or more panels may be fixed to the support members to provide a wall like structure around the perimeter of the

protected area **16**. The one or more panels may help prevent sun, rain, and debris from entering the protected area through the side walls **14***a*-**14***d*.

The illustrative boat cover system **30** may include a cover assembly **32** that can be moved between a raised position (see FIG. **2**A) and a lowered position (see FIG. **2**C). In the illustrative embodiment, the cover assembly **32** includes a support frame **38** and a cover **40**, wherein the support frame **38** supports the cover **40**. Also, four cover supports may be provided for supporting the cover assembly **32** above the platform **10**. Only the starboard side cover supports **46***a* and **46***b* are shown in FIGS. **2**A-**2**C. In some cases, the cover **40** may be a flexible material such as canvas, flexible plastic, or any other suitable flexible material. In other cases, the cover **40** may be a rigid material, such as fiberglass, metal or any other suitable rigid material. When the cover **40** is a rigid material, the support frame **38** may not need to be as extensive as when a flexible material is used, and in some cases, the support frame **28** may not be provided at all.

In the raised position, the cover assembly **30** provides some level of protection to the occupants of the pontoon boat **8** from sun, rain and/or other elements when the boat is in use. The cover assembly **30** may be positioned sufficiently far above the platform **10** so that people can walk under the cover assembly **30** without bending over. In the lowered position (see FIG. **2**C), the cover assembly **32** may provide protection to the interior of the pontoon boat **8** in the protected area **16**.

In some embodiments, the cover supports **46***a* and **46***b* may be adapted to allow the cover assembly **30** to be moved between the raised position (see FIG. **2**A) and the lowered position (see FIG. **2**C). In the illustrative embodiment, each cover support includes an upper leg and a lower leg. For example, cover support **46***a* includes an upper leg **48***a* and a lower leg **48***b*. In one illustrative embodiment, the lower end of the lower leg **48***b* may be pivotally connected to the side wall (or platform) as shown at **50**, the upper end of the lower leg **48***b* may be pivotally connected to the lower end of the upper leg **48***a* as shown at **52**, and the upper end of the upper leg **48***a* may be pivotally connected to the cover assembly **30**. In the illustrative embodiment, when the cover assembly **30** is lowered, the pivotal connection **52** between the lower leg **48***b* and the upper leg **48***a* of the cover support **46***a* moves toward the bow, and the pivotal connection **56** between the lower leg and the upper leg of the cover support **46***b* moves toward the stern (i.e. in opposite directions), however, this is not required in all embodiments.

In some cases, a bias may be applied via the cover supports **46***a* and **46***b* that biases the cover assembly **30** against gravity. The bias may be provided by one or more springs, rubber straps, compressed cylinders, or any other suitable bias providing element(s). The bias may make it easier to move the cover assembly **30** between the lowered position and the raised position, if desired. A bias may be provided, but it is not required.

In some cases, the cover assembly **30** can be moved between the lowered position and the raised position under human power. A crank, a wench, or simply pushing and/or pulling the cover assembly **30**, and/or any other suitable human powered moving mechanism or method may be employed. In other cases, the cover assembly **30** can be moved between the lowered position and the raised position using a powered system, such as a motor or pump. When a motor or pump is used, and in the illustrative embodiment, motion and/or energy from the motor or pump may be transferred to rotate the lower legs of the cover supports **46***a* and **46***b* in opposite directions to move the cover assembly **30** between the lowered and raised positions. Any number of methods may be used to transfer the motion and/or energy from the motor or pump to the lower legs of the cover supports **46***a* and **46***b* including via one or more belts, cables, screw drives, shafts, tracks, hydraulic cylinders, hydraulic tubes, pulleys, gears, and/or any other suitable system or method, as desired.

FIG. **2**A is a schematic side view of the pontoon boat **8**, with the cover assembly **30** in the raised position. FIG. **2**B is a schematic side view of the pontoon boat **8**, with the cover assembly **30** in an intermediate position, and FIG. **2**C is a schematic side view of the pontoon boat **8**, with the cover assembly **30** in the lowered position.

In some embodiments, and in the lowered position, a perimeter of the cover assembly **30** may extend laterally out to at least the side walls **14***a*-**14***d* of the pontoon boat **8** (see FIG. **3**) to provide a cover for all or substantially all of the protected area **16**. In some cases, the perimeter of the cover assembly **30** may extend laterally out past the side walls **14***a*-**14***d* of the pontoon boat **8**, and in some cases, overlaps in a downward vertical direction over a top portion of the side walls **14***a*-**14***d* (see FIG. **2**C and FIG. **4**), but this is not required in all embodiments. Such a vertical overlap may, in some cases, provide better protection to the protected area **16** of the pontoon boat **8** from wind swept rain, blowing dirt, dust, debris, etc.

FIG. **3** is a schematic cross-sectional exploded side view of a cover system **30** that extends to the side walls (e.g. side wall **14***c*) of a pontoon boat **8**. As can be seen, the illustrative cover system **30** includes a support frame **38** and a cover **40**, wherein the support frame **38** supports the cover **40**. In this illustrative embodiment shown in FIG. **3**, the cover system **30** is sized such that the perimeter of the cover system **30** extends and is roughly aligned with the side walls (e.g. side wall **14***c*) of the pontoon boat **8**. In some cases, the support frame **38** includes a lower support member **60** that extends around the perimeter of the support frame **38**, and rests on the top of the side walls (e.g. side wall **14***c*) when the cover assembly **30** is in the lowered position. In this configuration, rain or the like falling on the cover system **30** tends to run off the cover system **30** and down the outside of the side walls **14***c*, thereby providing protection to the protected area **16** of the pontoon boat **8**.

FIG. **4** is a schematic cross-sectional exploded side view of a cover system **30** that extends out laterally past the side walls (e.g. side wall **14***c*) of the pontoon boat **8**, and overlaps the top of the side wall **14***c* in a vertical direction as shown. In some embodiments, the support frame **38** may include one or more resting supports **62** that are elevated above the lower edge **66** of the support frame **38** and extend inward from the perimeter of the support frame **38**. These resting supports **62** may rest on the top of the side walls (e.g. side wall **14***c*) to support the cover assembly **30** when the cover assembly **30** is in the lowered position. Such a vertical overlap may, in some cases, provide better protection to the protected area **16** of the pontoon boat **8** from wind swept rain, blowing dirt, dust, debris, etc.

FIG. **4** also shows a safety strap **64** that may be selectively attached between the support frame **38** and the side wall (e.g. side wall **14***c*). The safety strap **64** may help ensure that the cover assembly **30** does not significantly rise up from the lowered position during high wind or other conditions. The safety strap **64** may be particularly useful when, for example, the pontoon boat **8** is being transported by trailer, where high wind conditions are expected. Also, safety strap **64** may provide a measure of safety during storms or the like. In some embodiments, multiple safety straps may be provided around the perimeter of the cover assembly **30** to help keep the cover

assembly **30** in the lowered position. While a safety strap **64** is only shown in FIG. **4**, it is contemplated that a safety strap may also be used in conjunction with the illustrative embodiment shown in FIG. **3**, as well as other embodiments, as desired. Also, rather than a safety strap **64**, a latch or the like may be used. While a safety strap **64** is shown in FIG. **4**, it is contemplated that any suitable mechanism may be used to help secure the cover assembly **30** relative to the side walls (e.g. side wall **14***c*), as desired.

FIG. **5**A is a schematic side view of one illustrative drive mechanism for the cover assembly **30** of FIG. **2**A-**2**C, with the cover system **30** in the lowered position. The illustrative drive mechanism includes a rotating shaft **70** that is driven by a motor or the like. A first cable **74** is attached to a lower connecting arm **72** of the lower arm **48***b* of the cover support **46***a* (see FIG. **2**A), and is wrapped around the rotating shaft **70** in a first direction. The lower arm **48***b* of the cover support **46***a* pivots about a pivot point **76**, as shown. Likewise, a second cable **78** is attached to a lower connecting arm **80** of the lower arm of the cover support **46***b* (see FIG. **2**A), and is wrapped around the rotating shaft **70** in a second direction, as shown. The lower arm of the cover support **46***b* pivots about a pivot point **82**, as shown.

To raise the cover assembly **30** of FIG. **2**C, the rotating shaft **70** is rotated in a clockwise direction, as shown in FIG. **5**B. With reference to FIG. **5**B, such rotation causes the rotating shaft **70** to wind up and shorten the first cable **74** and the second cable **78**, which pulls the lower connecting arm **72** and the lower connecting arm **80** toward each other. This causes the lower arm **48***b* of the cover support **46***a* to rotate in a counter-clockwise direction about the pivot point **76**, and the lower arm of the cover support **46***b* to rotate in a clock-wise direction about the pivot point **82**. This, in turn, causes the cover assembly **30** to move from the lowered position to the raised position, as best shown in FIGS. **2**A-**2**C. To move the cover assembly **30** from the raised position to the lowered, the rotating shaft **70** is rotated in the opposite direction.

In some cases, a bias may be applied to bias the cover assembly **30** against gravity. The bias may be provided by one or more springs, rubber straps, compressed cylinders, or any other suitable bias providing element(s). The bias may make it easier to move the cover assembly **30** between the lowered position and the raised position, if desired. Providing such a bias may help reduce the power and cost of the components used to move the cover assembly **30** between the lowered position and the raised position. For example, the size, power and cost of any motor (not shown) that is used to drive the rotating shaft **70** of FIG. **5**A may be reduced if a bias is applied to at least partially bias the cover assembly **30** against gravity.

FIG. **6**A is a schematic side view of the illustrative pontoon boat **8** of FIG. **1**, with a cover assembly **30** in a raised position. FIG. **6**B is a schematic side view of the pontoon boat of FIG. **6**A, with the cover assembly in an intermediate position, and FIG. **6**C is a schematic side view of the pontoon boat of FIG. **6**A, with the cover assembly in a lowered position. In this illustrative embodiment, the cover assembly **30** is supported above the platform by one or more telescoping support members. In the illustrative embodiment, four telescoping support members **90***a* and **90***b* are used, with only the telescoping support members on the starboard side shown. However, more or less telescoping members may be used, as desired. The telescoping members **90***a* and **90***b* may be any type of telescoping member that telescopes between an extended position (see FIG. **6**A) and a retracted position (see FIG. **6**B and FIG. **6**C). Illustrative telescoping members may include, for example, hydraulic cylinder type telescoping members, screw drive telescoping members, and/or any other type of telescoping member, as desired. The illustrative telescoping members **90***a* and **90***b* are shown having three telescoping sections, but it is contemplated that more or less telescoping sections may be used, as desired.

A lower end of the telescoping members **90***a* and **90***b* is shown secured to the platform **10**, and an upper end of the telescoping members **90***a* and **90***b* is shown secured to the cover assembly **30**. In some cases, the lower end or section of the telescoping members **90***a* and **90***b* may be secured to the side wall (such as side wall **14***c*) rather than, or in addition to, the platform **10**, as desired.

When the cover assembly **30** is moved under human power, the telescoping members **90***a* and **90***b* may help provide a bias against gravity so that the cover assembly **30** can more easily be lifted from the lowered position (see FIG. **6**C) to the raised position (see FIG. **6**A). For example, and in one illustrative embodiment, the telescoping members **90***a* and **90***b* may be adapted to compress a gas and/or a fluid when the cover assembly **30** is moved from the raised position to the lowered position, which then provides a bias force in the opposite direction. This may also help limit the speed at which the cover assembly **30** drops from the raised position to the lowered position. It is contemplated that other suitable methods may be used to provide a bias against gravity to the cover assembly. In some embodiments, a locking mechanism may be provided to lock the telescoping members **90***a* and **90***b* in the extended position (see FIG. **6**A) and/or the retracted position (see FIG. **6**C), as desired.

When the cover assembly is moved using a powered system, such as by a motor or pump, the telescoping members **90***a* and **90***b* may be adapted to transfer energy from the motor or pump to movement between the retracted position (see FIG. **6**C) and the extended position (see FIG. **6**A). In some cases, the telescoping members **90***a* and **90***b* may be telescoping hydraulic cylinders that respond to hydraulic fluid being pumped into and out of the hydraulic cylinders. In other cases, the telescoping members **90***a* and **90***b* may be moved between the retracted position (see FIG. **6**C) and the extended position (see FIG. **6**A) using a screw drive. For example, the intermediate section of the telescoping members **90***a* and **90***b* may be in threaded engagement with the lower section of the telescoping members **90***a* and **90***b*, such that when the intermediate section is rotated relative to the lower section, the intermediate section moves in relation to the lower section. Likewise, the upper section of the telescoping members **90***a* and **90***b* may be in threaded engagement with the intermediate section of the telescoping members **90***a* and **90***b*, such that when the upper section is rotated relative to the intermediate section, the upper section moves in relation to the intermediate section. Any other suitable powered telescoping system may also be used, as desired.

Like the illustrative embodiment shown in FIGS. **2**A-**2**C, the cover assembly **30** may be moved to the raised position (see FIG. **6**A) to provide some level or protection to the occupants of the boat in the protected area **16** from the sun and/or other elements, particularly when the sun is directly overhead. When the user does not intend to use the boat, the telescoping members **90***a* and **90***b* may allow the cover assembly **30** to be moved to the lowered position (see FIGS. **6**B-**6**C). In the lowered position, the cover assembly **30** may extend at least out to the side walls (e.g. sidewall **14***c*), and in some cases, may extend over and vertically overlap the top end of the side walls, around the perimeter of the protected area **16**. This may help protect the protected area from the elements when the boat is not in use.

FIG. **7**A is a schematic side view of another illustrative pontoon boat **100**, with a cover assembly **102** in a raised position. As can be seen, the pontoon boat **100** differs from the pontoon boat **8** of FIG. **1** in that the protected area is smaller. The protected area is defined by side walls, such as side wall **104**, which extends around the perimeter of the protected area. A non-protected area **106** of the pontoon boat **102** may still include side walls **108**, if desired, and as shown in FIGS. **7**A-**7**B. In the illustrative embodiment, the side walls **108** of the non-protected area **106** extend out from the side walls of the protected area, and are lower in height. This may allow the cover assembly **102** to vertically overlap the top of the higher sidewalls **104** of the protected area, without interfering with the sidewalls **118** of the non-protected area **106**.

In some cases, the sidewalls **108** of the non-protected area may be the same height as the side walls **104** of the protected area. When so provided, a slot may be provided in the side walls **108** of the non-protected area adjacent to the side walls of the protected area to allow the cover assembly **102** to vertically overlap the top of the higher side walls **104** of the protected area without interfering with the side walls **118** of the non-protected area **106**. In another embodiment, a slot or the like may be provided in the cover assembly. Alternatively, the cover assembly **30** may extend out to and rest on the side walls **104** of the protected area, and thus no slot may be provided in the side walls **108** of the non-protected area **106**. In yet another embodiment, no side walls may be provided around the non-protected area **106**. Any other suitable configuration may also be used, as desired.

In the illustrative embodiment of FIG. **7**A, the cover assembly **102** is supported above the platform by a number of pivoting support members. In the illustrative embodiment, four pivoting support members **110***a* and **110***b* are used, with only those on the starboard side shown. However, more or less pivoting support members may be used, as desired.

The lower end of each of the pivoting support members **110***a* and **110***b* is pivotally connected to the platform **114** and/or side walls **104** by a corresponding pivot member, such as pivot members **112***a* and **112***b*. In the illustrative embodiment, the upper end of each of the pivoting support members **110***a* and **110***b* is pivotally connected to the cover assembly **102**, as shown. As the pivoting support members **110***a* and **110***b* rotate in a clockwise direction, the cover assembly **102** is moved forward and down (see FIG. **7**B) until the cover assembly **102** engages and/or overlaps the side walls **104** (see FIG. **7**C) to provide protection to the protected area of the pontoon boat **100**. In some cases, the illustrative embodiment of FIGS. **7**A-**7**C may allow more of the protected area of the pontoon boat **100** to be exposed to the sun and/or other elements when the cover assembly **102** is in the raised position. Like above, the cover assembly **102** may be moved between the raised position (see FIG. **7**A) and the lowered position (see FIG. **7**C) either under human power, or by powered system such as a motor or pump system.

FIG. **8** is a schematic side view of the pontoon boat of FIG. **7**A, with the cover assembly **102** in the raised position and with a portion **120** of the cover assembly **102** folded down. In the illustrative embodiment, the rearward portion **120** of the cover assembly **102** is hinged with the remainder of the cover assembly **102** at a hinge point **122**. A lock mechanism may be provided to lock the rearward portion **120** in the upright position (see FIG. **7**A), and/or in the folded down position (see FIG. **8**), if desired. In some cases, the cover of the cover assembly may include one or more transparent or semi-transparent window(s) in the rearward portion **120** to help provide visibility in the rearward direction when the rearward portion **120** is folded down as shown. One or more transparent or semi-transparent window(s) may also be provided in the cover above the protected area, to provide additional light into the protected area when the cover assembly **102** is in the raised position, if desired.

FIG. **9**A is a schematic side view of the illustrative pontoon boat **100**, with a cover assembly **130** in a raised position. FIG. **9**B is a schematic side view of the pontoon boat of FIG. **9**A, with the cover assembly **130** in an intermediate position, and FIG. **9**C is a schematic side view of the pontoon boat **130** of FIG. **9**A, with the cover assembly **130** in a lowered position. In this illustrative embodiment, cover assembly **130** includes a rear support frame **132** and a front support frame **134**, wherein both the front support frame **132** and the rear support frame **134** support a cover **136**. A front and a rear support frame may also be provided on the port side of the pontoon boat **100**, but they are not shown in FIGS. **9**A-**9**C.

In the illustrative embodiment, the rear support frame **132** includes a main pivoting support member **140**, with a number of pivoting cover supports **142** and **144** extending off of the main pivoting support member **140**. The upper ends of the main pivoting support member **140** and each of the pivoting cover supports **142** and **144** may include a laterally extending member that extends transversely (into the page) across the protected area of the pontoon boat **100**. In some cases, the laterally extending members may each be received by a pocket or sleeve formed in the lower side of the cover **136**.

Likewise, the front support frame **134** may include a main pivoting support member **160**, with a number of pivoting cover supports **162** and **164** extending off of the main pivoting support member **160**. The upper ends of the main pivoting support member **160** and each of the pivoting cover supports **162** and **164** may include a laterally extending member that extends transversely (into the page) across the protected area of the pontoon boat **100**. The laterally extending members may each be received by a pocket or sleeve formed in the lower side of the cover **136**.

When the cover assembly **130** is in the fully raised position (see FIG. **9**A), each laterally extending member may engage one side of its corresponding pocket or sleeve. For example, the laterally extending member **150** may engage the left side of its corresponding pocket **152**. Likewise, when the cover assembly **130** is in the fully lowered position (see FIG. **9**C), each laterally extending member may engage the other side of it's corresponding pocket or sleeve. For example, the laterally extending member **150** may engage the right side of its corresponding pocket **152**. This may help the cover **136** to be pulled tight in both the raised position and lowered position, while allowing the rear support frame **132** and the front support frame **134** to change support configurations during the transition.

The lower ends of the main pivoting support members **140** and **160** may be pivotally attached to the side wall **104** of the pontoon boat **100**. In the illustrative embodiment shown, the main pivoting support member **140** is pivotally attached to the side wall **104** near the rear of the pontoon boat **100**, and the main support member **160** is pivotally attached to the side wall **104** near the front of the pontoon boat **100**. As the main support member **140** is rotated clockwise, and the main support member **160** is rotated counter-clockwise, the cover assembly **130** moves from the raised position shown in FIG. **9**A to the lowered position shown in FIG. **9**C.

In some embodiments, a rear driving support member **170** is pivotally attached to the rear main pivoting support member **140**, and a front driving support member **172** is pivotally attached to the front main pivoting support member **160**. The lower end of the rear driving support member **170** may be adapted to be moved in the rightward direction, as indicated

by arrow **174**, to move the cover assembly **130** from the raised position to the lowered position. Likewise, the lower end of the front driving support member **172** may be adapted to be moved in the leftward direction, as indicated by arrow **176**, to move the cover assembly **130** from the raised position to the lowered position. Conversely, the lower end of the rear driving support member **170** may be adapted to be moved in the leftward direction to move the cover assembly **130** from the lowered position to the raised position, and the lower end of the front driving support member **172** may be adapted to be moved in the rightward direction to move the cover assembly **130** from the lowered position to the raised position.

In some embodiments, the lower end of the rear driving support member **170** and the lower end of the front driving support member **172** may be slide along a track or the like, wherein the track or the like is attached to the platform and/or side walls of the pontoon boat **100** (see, for example, FIG. **15**). A drive mechanism may be provided for moving the lower end of the rear driving support member **170** and the lower end of the front driving support member **172** along the track. The drive mechanism may include, for example, a belt, a cable, a chain, a screw drive, a hydraulic drive, or any other suitable drive mechanism, as desired.

FIG. **10** is a schematic top view of another illustrative pontoon boat, generally shown at **180**. As can be seen, the pontoon boat **180** differs from the pontoon boat **8** of FIG. **1** and the pontoon boat **100** of FIG. **7**A in that the protected area **182** is even smaller in size. The protected area is defined by side walls **184***a*-**184***d*, which extend around the perimeter of the smaller protected area **182**. In some cases, a non-protected area **186** of the pontoon boat **180** may still include side walls **190***a*-**190***c*. In the illustrative embodiment, the side walls **190***a*-**190***c* of the non-protected area **186** extend out from side wall **184***b* of the protected area **182** and are lower in height, but his is not required in all embodiments. This may allow a cover assembly to vertically overlap the top of the higher sidewalls **184***a*-**184***d* of the protected area **182**, without interfering with the sidewalls **190***a* and **190***c* of the non-protected area **186**.

In some cases, the sidewalls **190***a*-**190***c* of the non-protected area **186** may be the same height as the side walls **184***a*-**184***d* of the protected area **182**. When so provided, a slot may be provided in the side walls **190***a* and **190***c* of the non-protected area **186** adjacent to the side wall **184***b* of the protected area **182** to allow a cover assembly to vertically overlap the top of the higher side walls **184***a*-**184***d* of the protected area **182** without interfering with the side walls **190***a* and **190***c* of the non-protected area **186**. Alternatively, a cover assembly may extend out to and rest on the side walls **184***a*-**184***d* of the protected area **182**, and thus no slot may be needed in the side walls **190***a* and **190***c* of the non-protected area **186**. In another embodiment, a slot or the like may be provided in the cover assembly. In yet another embodiment, no side walls may be provided around the non-protected area **186**. Any other suitable configurations may also be used, as desired.

By providing a smaller protected area **182** than in the pontoon boat **8** of FIG. **1** and the pontoon boat **100** of FIG. **7**A, a cover assembly may be made smaller. This may reduce the cost of the cover assembly and drive mechanism, and may allow more of the platform of the pontoon boat **180** to be exposed to the sun when the cover assembly is in the raised position. This may be more desirable for some boaters.

FIG. **11**A is a schematic side view of the illustrative pontoon boat **180**, with a cover assembly **198** in a raised position. FIG. **11**B is a schematic side view of the pontoon boat **180** of FIG. **11**A, with the cover assembly **198** in an intermediate position, and FIG. **11**C is a schematic side view of the pontoon boat **180** of FIG. **11**A, with the cover assembly **198** in a lowered position.

The illustrative cover assembly **198** is similar to that shown and described with reference to FIGS. **2**A-**2**C. However, in this illustrative embodiment, a screw drive mechanism generally shown at **210** is provided between pivot points **200** and **202** of cover supports **204***a* and **204***b*. The screw drive mechanism **210** may include, for example, a rotating screw **212** that is threaded with a support member **214**. A motor or the like may be provided at or near the pivot point **200** to rotate the rotating screw **212**. Alternatively, or in addition, a motor or the like may be provided at or near the pivot point **202** to rotate the support member **214**. Depending on the direction that the rotating screw **212** (and/or support member **214**) is rotated, the rotating screw **212** moves either in or out of the support member **214**, causing the cover assembly **198** to move toward the raised position (see FIG. **11**A) or toward the lowered position (see FIG. **11**C).

In some embodiments, the screw drive mechanism **210** may be similar to the screw drive used in FLOE Vertical Screw Boat Lifts, commercially available from FLOE International Inc., located in McGregor, Minn. In some cases, only one screw drive mechanism **210** is used, and may be positioned on, for example, either the starboard or port side of the pontoon boat **180**. In other cases, a screw drive mechanism **210** may be provided on both sides of the pontoon boat **180**, but this is not required in all embodiments. Also, although the screw drive mechanism **180** is shown in conjunction with pontoon boat **180**, it is contemplated that the screw drive mechanism **180** may be used on other boats, including the pontoon boat **8** of FIG. **1** and the pontoon boat **100** of FIG. **7**A, as desired.

FIG. **12**A is a schematic side view of the illustrative pontoon boat **180** of FIG. **10**, with a movable cover assembly **214** in a raised position. FIG. **12**B is a schematic side view of the pontoon boat **180** of FIG. **12**A, with the cover assembly **214** in an intermediate position, and FIG. **12**C is a schematic side view of the pontoon boat **180** of FIG. **12**A, with the cover assembly **214** in a lowered position. The illustrative cover assembly **214** includes a support frame **216** that supports a cover **218**. In the illustrative embodiment, the support frame **216** is hinged at an intermediate location **224**. A top end of a first support member **222** may be pivotally connected to the support frame **216** at or near the intermediate location **224**, as shown. A lower end of the first support member **222** may be connected to a track car **226**. The track car **226** may be adapted to slide along a track or the like (see, for example, FIG. **15**) that is positioned along the top of the side wall **238**, along the platform **240** of the pontoon boat **180**, or along some other location, as desired.

In the illustrative embodiment, a top end of a second support member **228** may be pivotally connected to a more forward location **230** of the support frame **216**, as shown. A lower end of the second support member **228** may be pivotally connected to an intermediate location **232** of the first support member **222**. A rear end of the support frame **216** of the cover assembly **214** may be pivotally connected to the side wall **238** at a rear location **236**, the platform **240**, or at some other location, as desired.

During use, the track car **226** may be moved forward from the location shown in FIG. **12**A. As the track car **226** is moved forward, the cover assembly **214** begins to move forward and down, as shown in FIG. **12**B. When the track car **226** is moved sufficiently far forward, the cover assembly **214** moves to a lowered position, as shown in FIG. **12**C. In the lowered position, the cover assembly **214** may extend at least out to the

side walls (e.g. sidewall **184***c*), and in some cases, may extend over and vertically overlap the top end of the side walls, around the perimeter of the protected area **182**. This may help protect the protected area **182** from the elements when the boat **180** is not in use. In some cases, the track car **226** may be moved under human power, while in others, the track car **226** may be moved using a powered motor, pump or other such device.

In some embodiments, the cover **218** may include a transparent or semi-transparent window. For example, such a window may be provided in a window region **240** in the cover **218**. This may improve the visibility in a rearward direction when the cover is in the raised position.

FIG. **13**A is a schematic top view of a cover assembly in an extended position. The illustrative cover assembly includes a support frame that has side support members **250***a* and **250***b*, and a number of transverse support members **252***a*-**252***e*. The side support members **250***a* and **250***b* may extend the length of the support frame, and the transverse support members **252***a*-**252***e* may extend the width of the support frame. The side support members **250***a*-**250***b* and the transverse support members **252***a*-**252***e* may be adapted to support a cover (not explicitly shown in FIGS. **13**A-**12**C).

In some embodiments, the support frame may be moved between an extended position and a retracted or partially retracted position. This may allow the occupants of a boat to adjust the area of the boat that is covered by the cover assembly, particularly when the cover assembly is in the raised position. In the illustrative embodiment, the side support members **250***a* and **250***b* may each include telescoping sections, such as telescoping sections **256***a*-**256***c*. By pushing on the transverse support member **252***e*, telescoping section **256***c* may be moved into telescoping section **256***b*, allowing the transverse support member **252***e* to be retracted toward transverse support member **252***d*, as shown in FIG. **13**B. Likewise, by pushing on the transverse support member **252***d*, telescoping section **256***b* may be moved into telescoping section **256***a*, allowing the transverse support member **252***d* to be retracted toward transverse support member **252***c*, as shown in FIG. **13**C. While a telescoping arrangement is shown in FIGS. **13**A-**13**C, it is contemplated that any suitable arrangement may be used to move the support frame (and cover) between an extended position and a retracted or partially retracted position.

FIG. **14**A is a schematic side view of another illustrative pontoon boat **278**, with a cover assembly **280** in a retracted storage position. FIG. **14**B is a schematic side view of the pontoon boat **278** of FIG. **14**A, with the cover assembly **280** in an intermediate position, and FIG. **14**C is a schematic side view of the pontoon boat **278** of FIG. **14**A, with the cover assembly **280** in an extended covering position. In the illustrative embodiment, the cover assembly includes a number of transverse support members **282***a*-**282***f* that support a cover **284**.

Each of the transverse support members **282***a*-**282***f* may be connected to a track car (e.g. track car **300** in FIG. **15**), that slides along a track **286**. In the illustrative embodiment, a right track **286** extends along the right side wall (e.g. side wall **290**) of a protected area of the pontoon boat **278**, and a left track extends along the left side wall (not shown) of a protected area of the pontoon boat **278**. It is contemplated, however, that the tracks may extend along the front and back side walls of the protected area, if desired.

From the retracted position shown in FIG. **14**A, the track cars attached to the most forward transverse support member **282***f* may be moved in a forward direction, as shown in FIG. **14**B. When the most forward transverse support member **282***f* moves forward sufficiently far, the next transverse support member **282***e* may be moved forward (see FIG. **14**B). This continues until the most forward transverse support member **282***f* reaches the front of the protected area of the pontoon boat (see FIG. **14**C).

In some embodiments, the cover **284** may include a number of spaced pockets or sleeves that each are adapted to receive a corresponding one of the transverse support members **282***a*-**282***f*. Thus, when the most forward transverse support member **282***f* is pulled forward sufficiently far, so that the portion of the cover **284** between the most forward pocket or sleeve and the pocket or sleeve that receives the next transverse support member **282***e* becomes tight, the cover begins pulling the next transverse support member **282***e* forward. This may continue until the most forward transverse support member **282***f* reaches the front of the protected area of the pontoon boat (see FIG. **14**C). In the illustrative embodiment, the rear most transverse support member **282***a* may be fixed at or near the rear of the protected area of the pontoon boat. It is contemplated that the transverse support member **282***a*-**282***f* may extend up from the side walls sufficiently far to support the cover and provide clearance over seats, control consoles and/or anything else in the protected area, if desired.

In some cases, the transverse support members **282***a*-**282***f* may be moved under human power, while in others, the transverse support members **282***a*-**282***f* may be moved using a powered motor, pump or other such device.

FIG. **15** is a schematic cross-sectional side view of a track and a movable support member. In the illustrative embodiment, the movable support member may be the transverse support member **282***f* of FIGS. **14**A-**14**C. However, the movable support member may be any other support member, including those shown and described in other embodiments of the present invention.

The movable support member may be connected to a track car **300** as shown. It is contemplated that the movable support member may be directly connected to the track car **300**, pivotally connected, integrally formed with, or connected in any other suitable way. A track **286** may be provided for receiving the track car **300**. In the illustrative embodiment, the track **286** includes a cavity that is shaped to receive the track car **300**. In some embodiments, the track car **300** may include one or more sliders **302***a*-**302***f*. The sliders **302***a*-**302***f* may be made from plastic, Teflon™, metal, or any other suitable material, as desired. The sliders **302***a*-**302***f* may help reduce the friction between the track car **300** and the track **286**. In some cases, the sliders **302***a*-**302***f* may include wheels, ball bearings or the like. The track **286** and track car **300** arrangement may be used in conjunction with any number of illustrative embodiments, including those shown in FIGS. **9**A-**9**C, **12**A-**12**C, **14**A-**14**C, as well as other embodiments, as desired.

FIG. **16** is a schematic block diagram of a control system for a powered cover system for a boat. The illustrative control system may include a controller **400** that is coupled to a drive mechanism **402**. The drive mechanism **402** may include, for example, a motor, a pump, or any other powered system for moving the cover system of a boat between a first position and a second position. The drive mechanism **402** may also receive power from a power source **404**, either directly or from the controller **400**, as desired.

The controller **400** may be adapted to control the drive mechanism **402** to move the cover system between a first position (e.g. raised or retracted position) and a second position (e.g. lowered or extended position). The controller **400** may include, for example, a microprocessor, a number of

relays or power transistors, a memory, switches, a timer and/or any other suitable device or devices to provide the desired level of control.

In some embodiments, the controller **400** may be coupled to a user interface **406**. The user interface **406** may allow a user to interact in some way with the controller **400**. For example, the user interface **406** may include one or more switches and/or buttons. In some cases, the user interface may include a display, such as an LCD display, and/or one or more light indicators such as LED indicators. In some cases, the user interface **406** may be mounted on the control console of the boat.

The controller **400** may also be coupled to one or more sensors **408**. The sensors may include, for example, a rain sensor, a wind speed sensors, a light sensor, a current and/or voltage sensor, and/or any other type of sensors as desired. In one example, the controller **400** may receive a signal from a rain sensor that indicates that rain is present, and may move the cover from a raised position to a lowered position. The controller **400** may also be coupled to one or more lights and/or horns **410**. The controller **400** may first provide a warning light and/or warning sound via the lights and/or horns **410** prior to moving the cover from the raised position to the lowered position. In some cases, the user may override the controller **400** from moving the cover from the raised position to the lowered position after the warning light and/or warning sound is provided.

In another example, the controller **400** may receive a signal from a wind speed sensor that indicates that the wind speed has exceeded a threshold value, and may move the cover from a raised position to a lowered position. In some cases, the controller **400** may first provide a warning light and/or warning sound via the lights and/or horns **410** prior to moving the cover from the raised position to the lowered position. In some cases, the user may override the controller **400** from moving the cover from the raised position to the lowered position after the warning light and/or warning sound is provided.

In yet another example, the controller **400** may receive a signal from a light detector that indicates that the sun has gone down, and may move the cover from a raised position to a lowered position. In some cases, the controller **400** may first provide a warning light and/or warning sound via the lights and/or horns **410** prior to moving the cover from the raised position to the lowered position. In some cases, the user may override the controller **400** from moving the cover from the raised position to the lowered position after the warning light and/or warning sound is provided.

The controller **400** may also monitor one or more current or voltage sensors to determine if the boat is or has recently been underway, and/or if there are other signs that occupants may be using the boat (e.g. radio on). In some cases, the controller **400** may not move the cover from the raised position to the lowered position if the boat is currently underway or it is believed that the boat is otherwise currently occupied.

The controller **400** may also monitor one or more current or voltage sensors to determine the load on the drive mechanism **402**. If the load on the drive mechanism **402** exceeds a threshold value, the controller **400** may remove power from the drive mechanism **402**, or reverse the direction of movement of the cover. This may provide a level of safety, much like the safety mechanisms of a garage door opener.

The controller **400** may also receive a command from the user interface **406** to move the cover between a first position and a second position. In some cases, the controller **400** may include a timer, and the controller may provide one or more visual and/or audible warnings via lights and/or horns **410** over a period of time, as specified by the timer, before moving the cover between the first position and the second position. This may provide a level of safety so that people around the boat will know that the cover is about to be moved. When the user interface is mounted in the boat, such as on the control console, this delay may allow a user sufficient time to egress the boat before the cover is moved between the first position and the second position.

In some cases, the drive mechanism **402** may control the position of the cover, both in an upward and downward direction. Thus, when the cover is in the lowered or covering position, the cover may not be able to be easily moved without activating the drive mechanism **402**. Thus, in some cases, the cover may provide some level or security to the contents in the boat when the boat is not in use. The controller **400** may be adapted to require a key, a code or some other security measure to help prevent unauthorized activation and movement of the cover.

In some cases, the controller **400** may be coupled to one or more antennae **412**. A remote controller **414** may be provided to provide remote control signals to the controller **400**. For example, the remote controller **414** may provide a command to move the cover from a first position to a second position, or visa versa. The controller **400** may receive this command via the antennae **412**, and instruct the drive mechanism **402** to perform the requested action. The controller **400** may also be programmed to turn on one or more lights and/or provide one or more sounds or the like before and/or during some actions. For example, when the controller **400** receives an instruction to move the cover from a raised position to a lowered position, the controller may first beep a warning tone for a period of time, turn on or flash one or more lights, and then instruct the drive mechanism to move the cover from the raised position to the lowered position, if desired. It is contemplated that the remote controller **414** may be any type of remote control device, and in some cases, may be similar to a remote keyless entry device commonly used for automobiles.

Having thus described the preferred embodiments of the present invention, those of skill in the art will readily appreciate that yet other embodiments may be made and used within the scope of the claims hereto attached. It will be understood that this disclosure is, in many respect, only illustrative. Changes may be made in details, particularly in matters of shape, size, and arrangement of parts without exceeding the scope of the invention.

What is claimed is:

1. A cover assembly for a boat, wherein the boat has a front, a back, a length, and two sides, the boat further having side walls extending up from a floor of the boat on at least two lateral sides of the boat defining at least part of a protected area, the protected area corresponding to an open deck portion of the boat that can accommodate occupants of the boat during normal use of the boat, the one or more side walls are configured to prevent or substantially prevent windswept rain from passing through the side walls of the boat and into the protected area from a lateral direction, the cover assembly comprising:

a cover having a front edge, a rear edge and two lateral side edges collectively defining the covering extent of the cover;

a support frame for supporting the cover above the boat, the support frame configured to allow the cover to be moved between a raised position and a lowered position, wherein, in the lowered position, the two lateral sides of the cover are lowered to be adjacent to a top end of a corresponding side wall on each of the least two lateral sides of the boat such that windswept rain is prevented or

substantially prevented from entering the at least part of the protected area between the cover and the corresponding side walls, and in the raised position, the cover is suspended above the floor sufficiently far so that occupants of the boat can move about there under;

the support frame having one or more elongated laterally rigid support members positioned along each of two lateral sides of the boat, each of the one or more elongated laterally rigid support members are part of, or fixed to, the support frame in both the raised position and lowered position and traverse from a coupling end toward the cover, wherein the coupling end of each of the elongated laterally rigid support members is configured to be rotatably coupled relative to the boat about a rotational axis, wherein each of the one or more elongated laterally rigid support members are configured to rotate about the corresponding rotation axis and remain laterally rigid when the cover is moved between the raised position and the lowered position; and

the support frame further configured such that the entire front edge of the cover is movable in a lengthwise direction relative to the rear edge of the cover to shorten the covering extent of the cover assembly in the lengthwise direction when moving from an extended position to a retracted position.

2. The cover assembly of claim **1** further comprising:

a motor for moving the cover between the lowered position and the raised position.

3. The cover assembly of claim **2** further comprising a screw drive device coupled to the motor for transferring energy from the motor to move the cover between the lowered position and the raised position.

4. The cover assembly of claim **1** further comprising:

a pump; and

one or more hydraulic cylinders coupled to the pump for transferring energy from the pump to move the cover between the lowered position and the raised position.

5. The cover assembly of claim **1** wherein, in the lowered position, the two lateral side edges of the cover extend laterally out past the side walls of the boat.

6. The cover assembly of claim **1** wherein, in the lowered position, the two lateral side edges of the cover assembly extend laterally out past the side walls and overlaps in a vertical direction a top portion of the one or more side walls.

7. The cover assembly of claim **1** wherein the cover is moved between the raised position and the lowered position under influence of a motor.

8. The cover assembly of claim **1** wherein the cover is moved between the raised position and the lowered position under human power.

9. The cover assembly of claim **1** wherein the cover is moved between the raised position and the lowered position under influence of a pump and one or more hydraulic cylinders.

10. The cover assembly of claim **1** wherein one or more components of the support frame are provided in a telescoping arrangement.

11. The cover assembly of claim **10** wherein one or more of the elongated laterally rigid support members are provided in a telescoping arrangement.

12. The cover system of claim **1**, wherein the rotation axis of each elongated laterally rigid support member is positioned at a fixed location along the length of the boat when the cover is moved between the raised position and the lowered position.

13. A cover assembly for a boat, wherein the boat has a front, a back, a length, and two sides, the boat further having one or more side walls extending up from a floor of the boat around at least part of a protected area, wherein the protected area is configured to accommodate occupants of the boat during normal use of the boat, the cover assembly comprising:

a flexible cover;

a support frame configured to pull the flexible cover taut, and to support the flexible cover above the boat;

the support frame also configured to allow the flexible cover to be moved between a raised position and a lowered position, wherein, in the lowered position, the flexible cover provides a mooring cover for at least a substantial portion of the protected area, and in the raised position, the cover is suspended above the floor sufficiently far so that occupants of the boat can move about the protected area and under the cover;

the support frame including one or more elongated laterally rigid support members positioned along each of two lateral sides of the boat, each of the one or more elongated laterally rigid support members are part of, or fixed relative to, the support frame in both the raised position and lowered position, and extend to a rotatable coupling that is configured to be positioned at a fixed location along the length of the boat, wherein each of the one or more elongated laterally rigid support members are configured to rotate about a rotation axis and remain laterally rigid when the flexible cover is moved between the raised position and the lowered position; and

the support frame is further configured such that a front and/or rear end of the flexible cover is movable in a lengthwise direction to change the overall length of the support frame when moved between an extended position and a retracted position, and wherein the support frame does not pull at least part of the flexible cover taut when in the retracted position that is pulled taut by the support frame when in the extended position.

14. The cover assembly of claim **13** wherein the flexible cover is made substantially from canvas.

15. The cover assembly of claim **13** wherein the flexible cover is made substantially from a flexible plastic.

16. The cover assembly of claim **13** wherein one of the elongated members is at least partially secured relative to the flexible cover via one or more pockets provided by the flexible cover.

17. A cover assembly for a boat having a passenger well defined by one or more side walls and a floor situated below a top end of the one or more side walls, wherein the passenger well is configured to accommodate occupants of the boat during normal use of the boat, the cover assembly comprising:

a flexible cover;

a support frame comprising a number of articulating elongated bars that support the flexible cover above the boat, and when articulated, the articulating elongated bars move the flexible cover between a raised position and a towered position, wherein, in the lowered position, the flexible cover provides a mooring cover for a substantial portion of the passenge well, and in the raised position, the flexible cover is suspended above the boat sufficiently far so that occupants of the boat can move about the passenger well and under the flexible cover, the support frame being configured such that at least one of the articulating elongated bars provides tension to the flexible cover to pull at least a substantial part of the flexible cover taut in both the raised position and the lowered position.

18. The cover assembly of claim 17 wherein at least a substantial portion of the flexible cover is made from canvas.

19. The cover assembly of claim 17 wherein at least a substantial nortion of the flexible cover is made from a flexible plastic.

20. The cover assembly of claim 17 wherein one of the articulating elongated bars is secured, at least in part, relative to the flexible cover via one or more pockets provided by the flexible cover.

21. The cover assembly of claim 17 wherein the support frame is configured such that a front and/or rear end of the flexible cover is retractable in a lengthwise direction from an extended position to a retracted position, wherein in the retracted position, the front and/or rear end of the cover is moved in a lengthwise direction relative to the extended position.

22. A cover system for a boat having a protected area, wherein the protected area is configured to accommodate occupants of the boat during normal use of the boat, the cover system comprising:

a cover having a pocket with a pocket width and a pocket length, wherein the pocket length extends in a transverse direction across the cover;

a support frame coupled to the boat for supporting at least part of the cover above the boat, the support frame having a pivoting support member pivotally secured relative to the boat, the support frame configured to allow the cover to be moved between a raised position and a lowered position, wherein, in the lowered position, the cover provides a cover for the protected area, and in the raised position, the cover is suspended above the boat sufficiently far so that occupants of the boat can move about there under;

the support frame including at least one cover support member that extends transversely across the cover, through the pocket of the cover and along the pocket length, the pocket width being substantially greater than a corresponding outer dimension of the at least one cover support member; and

wherein when the support frame moves the cover between the raised position and the lowered position, the at least one cover support member slides relative to the cover within the pocket along at least part of the pocket width.

23. The cover system of claim 22 wherein the at least one cover support member slides relative to the cover along at least a majority of the pocket width.

24. The cover system of claim 23 wherein the pocket width is greater than 3 times the corresponding outer dimension of the at least one cover support member.

25. A cover system for a boat having a passenger well defined by two lateral side walls and a floor situated below a top end of the two lateral side walls, wherein the passenger well is configured to accommodate occupants of the boat during normal use of the boat, the passenger well defined by the two lateral side walls including a control console for driving the boat, the cover system comprising:

a flexible cover formed from a canvas or fabric material, the flexible cover having a front edge, a rear edge and two lateral side edges;

a support frame configured to pull the flexible cover taut, and to support the flexible cover above the boat;

the support frame further configured to allow the flexible cover to be moved between a raised position and a lowered position, wherein, in the lowered position, the flexible cover provides a mooring cover for at least a substantial portion of the passenger well, whereby the lateral side edges of the flexible cover are lowered to be adjacent the top end of at least part of the two lateral side walls such that windswept rain is prevented or substantially prevented from entering between the flexible cover and the corresponding part of the lateral side walls, and in the raised position, the flexible cover is suspended above the boat sufficiently far so that occupants of the boat can move about the protected area and under at least part of the flexible cover; and

the support frame including one or more articulating support members along each of two lateral sides of the boat, each of the one or more articulating support members has a first end that is part of, or fixed to, the support frame in both the raised position and lowered position the one or more articulating support members are structured such that, when articulated, the articulating support members direct and move the flexible cover along a defined path between the raised position and the lowered position.

26. The cover system of claim 25 wherein, in the raised position, a first part of the flexible cover is in a horizontal or substantially horizontal orientation, and a second part of the flexible cover is in an articulated position that is not in a horizontal or substantially horizontal orientation.

27. The cover system of claim 26 wherein the second part of the flexible cover is in an articulated position that is in a vertical or substantially vertical orientation.

28. The cover system of claim 26 wherein the second part of the cover articulates to the articulated position as the flexible cover is moved from the lowered position to the raised position.

29. The cover system of claim 25, wherein the support frame is further configured such that the front and/or rear edge of the flexible cover is movable in a lengthwise direction to change the overall length of the support frame and flexible cover when moved between an extended position and a retracted position, and wherein the support frame does not pull at least part of the flexible cover taut when in the retracted position that is pulled taut by the support frame when in the extended position.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,520,240 B2
APPLICATION NO. : 10/905818
DATED : April 21, 2009
INVENTOR(S) : Brian N. Tufte

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

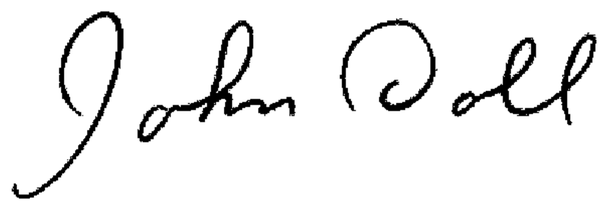
Column 18
Line 57, delete “towered”, and insert therefor --lowered--.

Line 59, delete “passenge”, and insert therefor --passenger--.

Column 19
Line 4, delete “nortion”, and insert therefor --portion--.

Signed and Sealed this

Twenty-eighth Day of July, 2009



JOHN DOLL
Acting Director of the United States Patent and Trademark Office